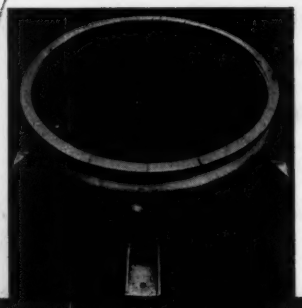
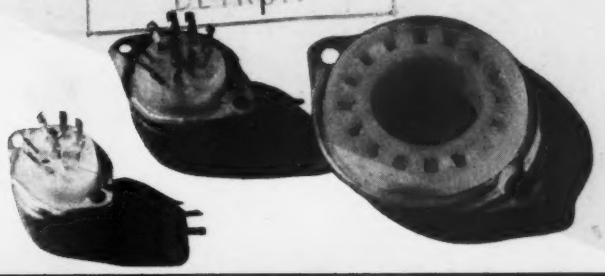
Plastics

DEALING WITH THE MANUFACTURE, USES AND POTENTIALITIES OF PLASTIC MATERIALS

JUL 27 1954
DETROIT
#204





Remarkable 'FLUON'

'Fluon' p.t.f.e., often referred to as the 'noble plastic', is unaffected by all known chemicals, except fluorine and molten alkali metals, over a temperature range of -80° to 250°C. It possesses outstanding resistance to heat, unusually good insulating properties even under very humid conditions, and is chemically stable and non-toxic. A wide variety of applications has already been found for 'Fluon' from special purpose valve holders to non-stick bakery rollers, from gaskets and packings for chemical plant to insulation for high frequency cables.

Bakery rollers covered by Dunlop Rubber Co. Ltd., G.R.G. Division for Thomas Barker and Sons Ltd.

Top Right. Valve holders by The Edison Swan Electric Co. Ltd.

Top Left. 4 ft. 'Fluolion' gasket by James Walker & Co. Ltd., for Enamelled Metal Products Corp. (1933) Ltd.

Left. Tubular condensers by The Telegraph Condenser Co. Ltd.

'FLUON' — **FOR THE EXCEPTIONAL JOB**

'Fluon' is the registered trade mark of the polytetrafluoroethylene manufactured by I.C.I.

IMPERIAL CHEMICAL INDUSTRIES LIMITED, LONDON, S.W.1.

P.570

VR V. 19² Jy-D '54

Tri-ang REG. TRADE MARK RAILWAYS

Manufactured by

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Erinoid

CELLULOSE ACETATE

powders

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Tech

Beautiful Yorkshire
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Creskeld Lane, Arthington

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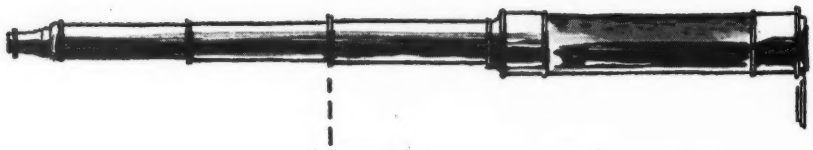
"ELO" SYNTHETIC RESIN PRODUCTS

Embracing Completed Mouldings, Moulding powders, Resins, solid, powdered, or in solution, Insulating Varnishes, Cements, Lacquers, Anti-friction resins for fabric bearings, Casting resins, Capping cements, Filling Compounds, Sealing fluids.

London Office: 79 Baker Street, W.1.



What do you look for in a moulding material?

Maybe your main need is cheapness, maybe lightness or freedom from design limitations. If you want all three, then polystyrene is the answer. And where polystyrene is the need, Kleestron Colorant Blend 604 is the choice. This brand, produced under ideal conditions at Welwyn Garden City, England, combines the usual virtues of polystyrene with an unsurpassed degree of *versatility*. If that is what you're looking for you need look no further.

the Versatile plastic

Supplied as fines, granules or a mixture of both

KLEESTRON COLORANT
BLEND 604

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USE Geon PVC *for shoes like these!*

Geon PVC makes the ideal material for modern footwear. Leathercloth made with this plastics raw material is exceptionally hard-wearing and flexible, enabling the shoes to retain their shape and attractiveness whilst giving long, comfortable service. This is just another way in which the valuable properties of Geon PVC raw materials are being usefully employed.

Please write for Booklet No. 51, briefly describing Geon PVC raw materials. (The shoes illustrated are made from "Melloroid" leathercloth manufactured by Mellowhide Products Limited.)

Geon
Polyvinyl Materials

BRITISH GEON LIMITED

SALES AND TECHNICAL SERVICE

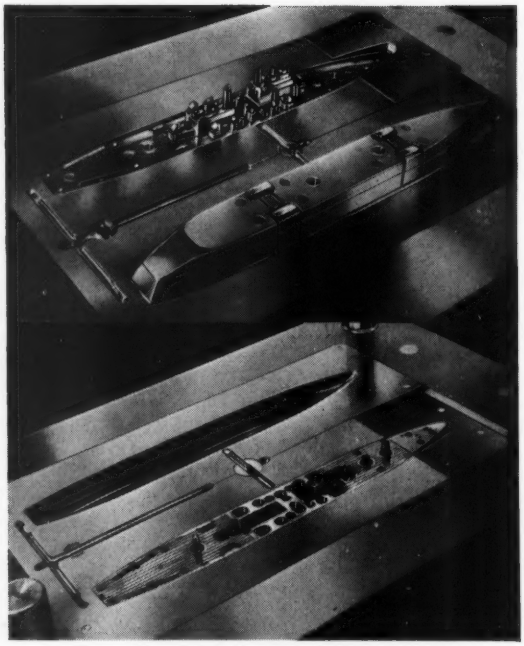
Devonshire House, Piccadilly, London, W.1 Tel: MAYfair 8867

"Geon" is a Reg'd Trade Mark

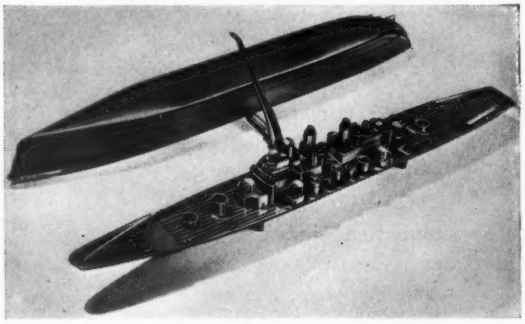
If it's *INTRICACY* you're after

—or the simplest job in the world—choose moulds by Plastools. Unsurpassed in their standards of intricacy and precision, Plastools moulds are craftsman-made to the most exacting specifications. Whether you're producing luxury articles or strictly utilitarian goods, you'll find that moulding your business along the Plastools line will give you—and your customers—the greatest satisfaction.

it's moulds by Plastools!



Here, to give you an idea of what we can do, are the male and female parts of one of a series of moulds built for the Pyro Plastic Corporation, Pyro Park, Union, New Jersey, U.S.A.



The 16"-long model, even when seen straight from the mould, shows the intricate and accurate detail you come to expect of Plastools-moulded articles.

The finished product —a really lifelike replica of the United States Navy's heavy cruiser, "U.S.S Chicago".

Plastools (LONDON) Limited

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A Moulding Powder for long and short flowing work

An improved general purpose powder with excellent curing and moulding properties. Suitable for long and short flowing work. Approved for use in Post Office Spec. S.116 Grade (Telephones) and R.C.S. 1000 Grade 3. MM. 137 can also be released against A.I.D. and C.I.A. contracts. Available in a wide range of flows, colours and mottles.

Powder Density (grms/cc)	0.6
Bulk Factor	2.25
Pelleting Properties	GOOD
Shrinkage (inch/inch)	0.005–0.008
Density of Mouldings	1.35
Impact Strength (ft./lbs.)	0.13–0.16
Tensile Strength (lbs./sq. inch)	6000–8000
Water Absorption (mgms)	90–100
Electric Strength @ 90°C (Volts/mil)	60–150
Electric Strength @ 20°C (Volts/mil)	150–250
Surface Resistivity (megohms/cm^2)	
(1) Freshly moulded	10^4–10^5
(2) After 24 hrs. in water	10^3–10^4
Volume Resistivity (megohms/cm^3)	10^5–10^6
Cure—seconds to obtain a blister free cup	70–75
Moulding Temperature	300°F–350°F

RESINOUS CHEMICALS LIMITED

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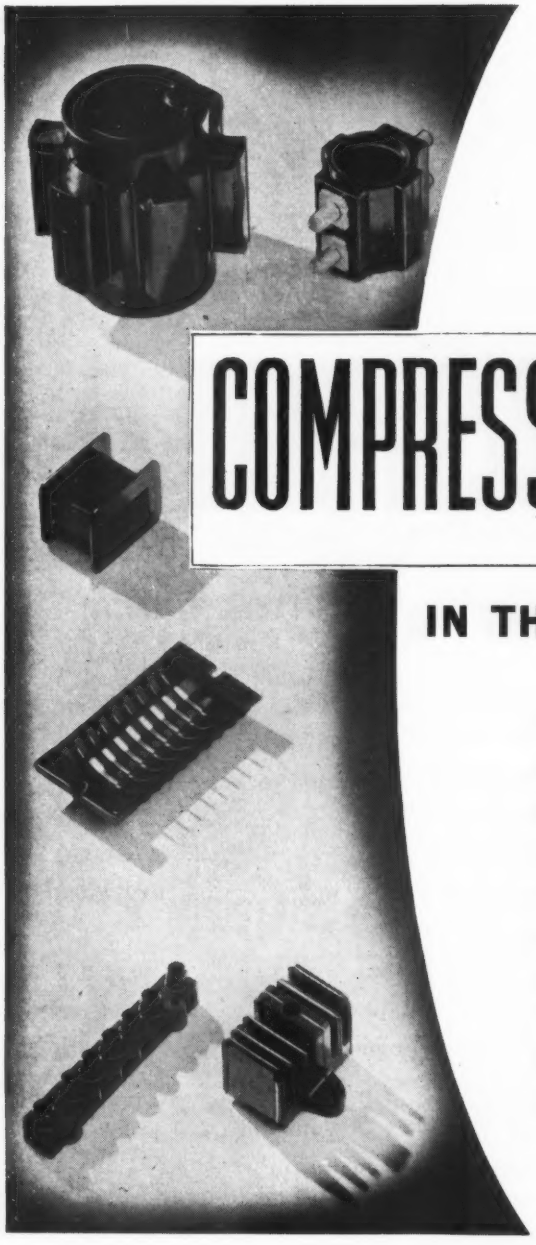

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You, too, can entrust your work to Thermo-Plastics Ltd. where production is planned to keep abreast of customers' requirements.

A highly qualified technical staff is at your service.

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Moulders and fabricators of all plastic materials, including glass and asbestos reinforced laminates, Perspex, P.V.C., Polystyrene, Cellulose Acetate, Polyethylene, Nylon, Phenol - Formaldehyde, Urea - Formaldehyde, etc.

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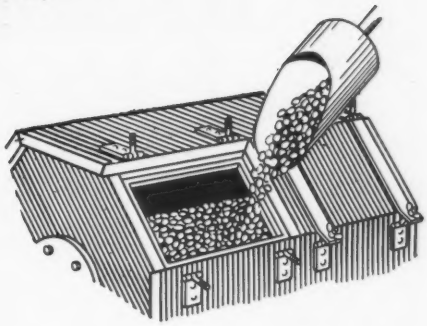
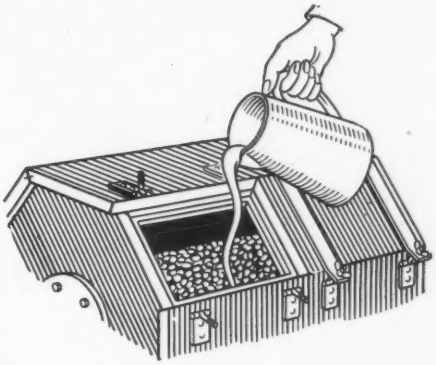
These finishing materials are the result of over twenty-five years of development in Lacrinoid's own works . . . they cannot be surpassed anywhere.



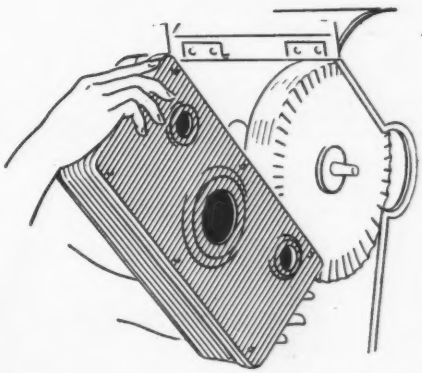
Granules for barrel finishing

for the barrel surfacing of plastics and wooden parts. The granules are of porous stone impregnated with a special bonding and lubricating compound. Their use prevents formation of dust and protects the material from abrasions. The granules can be reimpregnated after a period of use.



Polishing Cream No. 10 for barrel polishing

for the barrel polishing of small and medium sized plastics objects. A lasting, brilliant lustre is imparted with great speed and with the very minimum of supervision.



Bar Polish No. 11 for mop polishing

performs simultaneously the functions of (1) abrasion, (2) finishing and (3) glossing. It is fast in action and not only saves time but results in considerable economies in the replacement cost of mops.

Apply for descriptive leaflets which give fuller details of above materials

The services of the Lacrinoid Research Department are freely offered in any development of finishing and polishing techniques.

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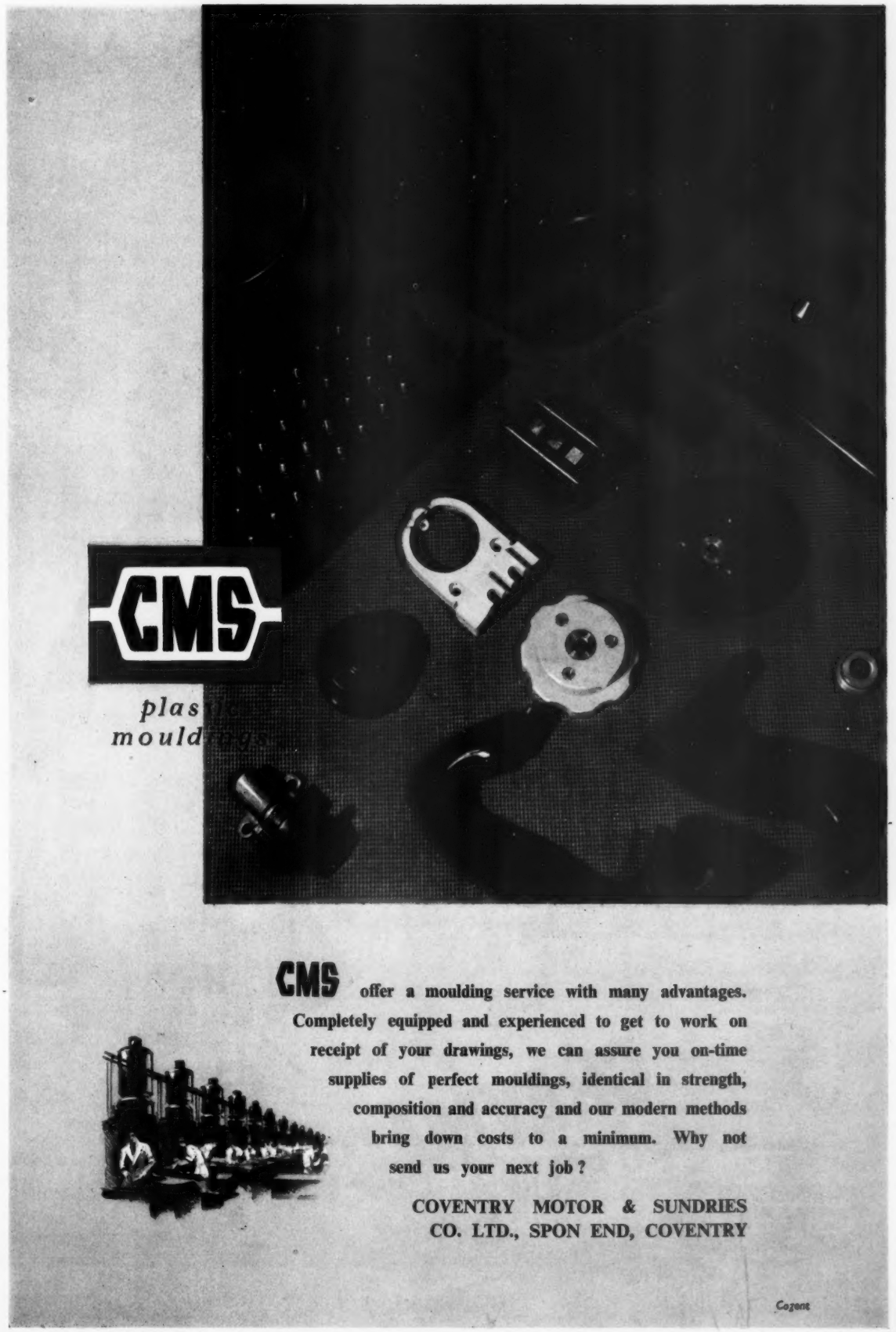

CMS offer a moulding service with many advantages. Completely equipped and experienced to get to work on receipt of your drawings, we can assure you on-time supplies of perfect mouldings, identical in strength, composition and accuracy and our modern methods bring down costs to a minimum. Why not send us your next job?

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Texturised finishes

They give that silky, luxurious look that's the basis of the new glamour in rainwear. In six muted shades the new Craymac P.V.C. sheeting is really strong—can be welded or sewn and styled at will.

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Rainwear stylists and users of P.V.C. sheeting are invited to send for a new shade folder. Samples of all shades and gauges in translucent, opaque, metallic or laminates gladly sent on request.

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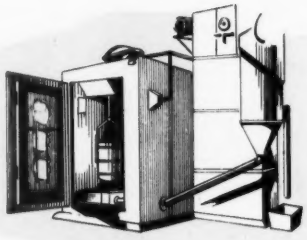
A Greenwich PRODUCT

The Art of Blasting

We are finding it increasingly difficult to explain our special Processes to the Immortals in terms they understand.

For instance, Jupiter (known as *The Thunderer* and called other rude names by mortals in his day) failed to grasp the purpose of our thorough cleansing of 'Nestorite' Drums by shot-blasting. He only knew his own method—that of ejecting unlimited lethal thunderbolts from the top of Mt. Olympus. During his stay with us, he heard about *The Blasted Oak* but *Blasted Drums* never.



"Venus, however, got nearest to the purpose of our process—that of putting a "new complexion" on things such as the interior surface of our drums. She produced her powder compact—purchased at a multiple store—and begged us to shot-blast her face to remove a muddy complexion caused by over-indulgence in certain earth comestibles known as "hot dogs".

Being kind-hearted folk, we urged her to try instead a certain type of toilet soap—or alternatively, one of those advertised detergents that excelled in "sheet whiteness".

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any colour, any shape!

Every day, hundreds of industries, and especially those connected with light engineering, are finding new uses for LUSTREX*, Monsanto's polystyrene. The growing popularity of this versatile and economical plastic is easily explained: Lustrex is light yet strong; has excellent insulating characteristics; can be made into almost any intricate shape; and is supplied in a wide range of colours—transparent—translucent—opaque—crystal clear. *Write now for further information.*

*(*Registered Trade Mark)*

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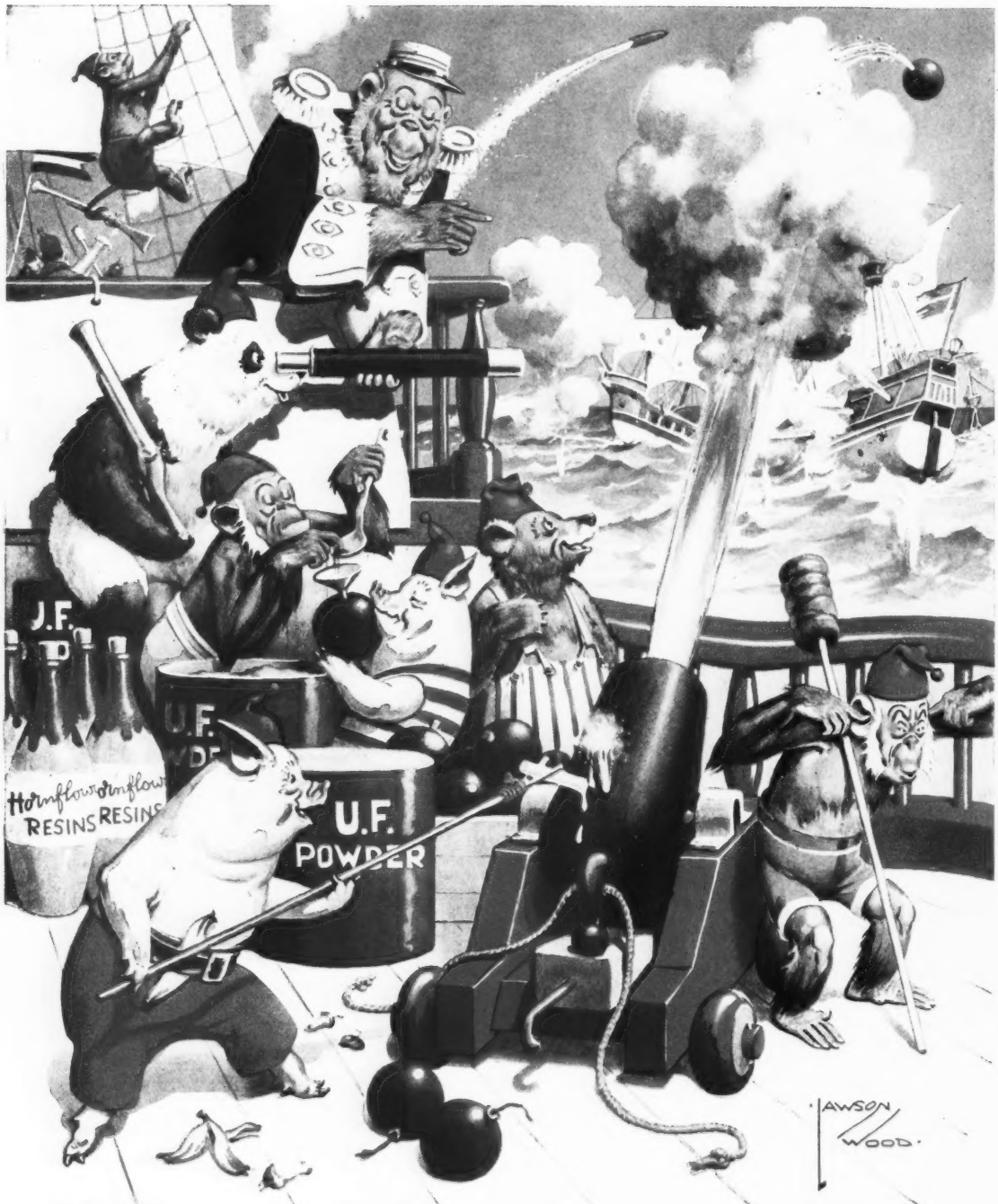

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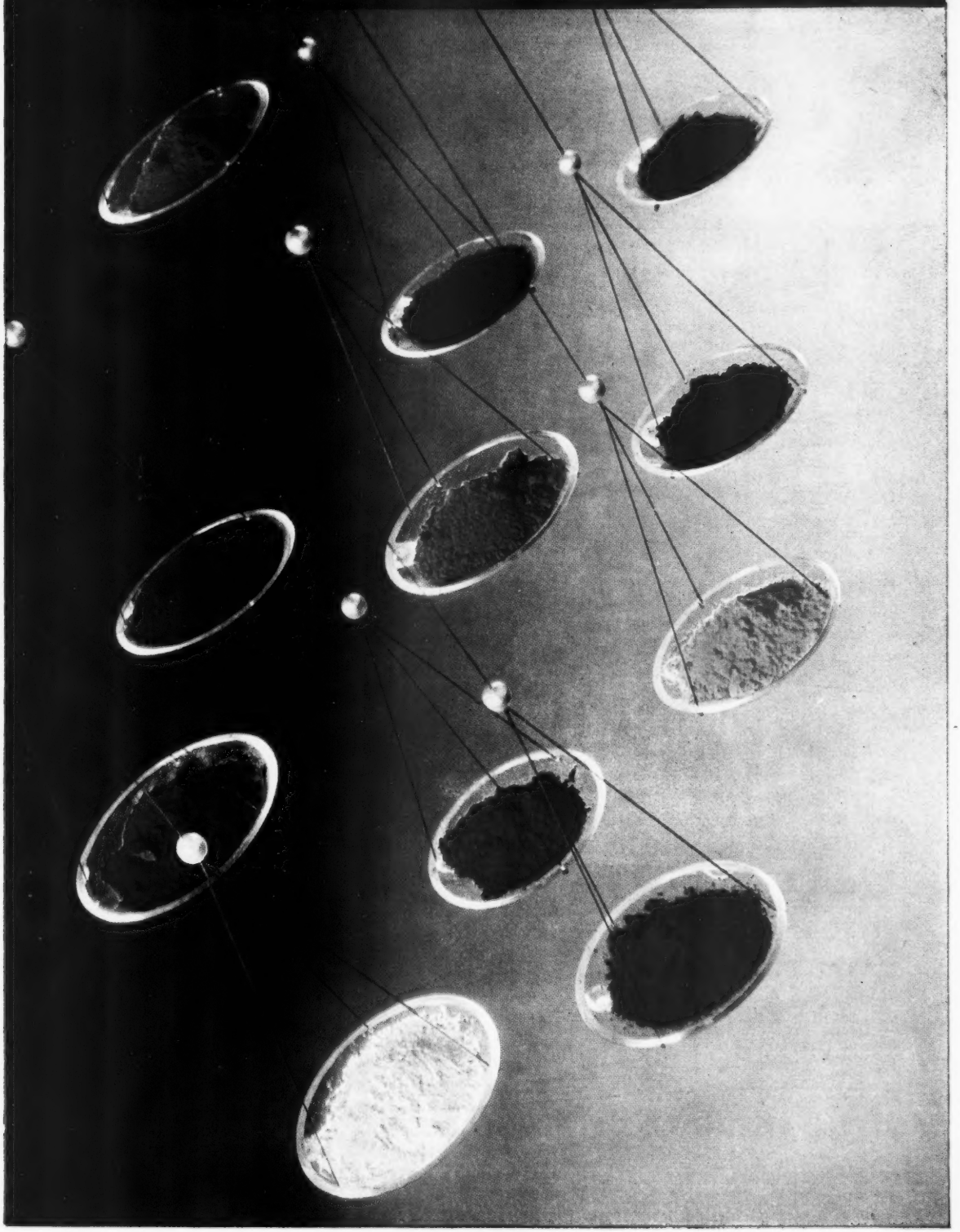

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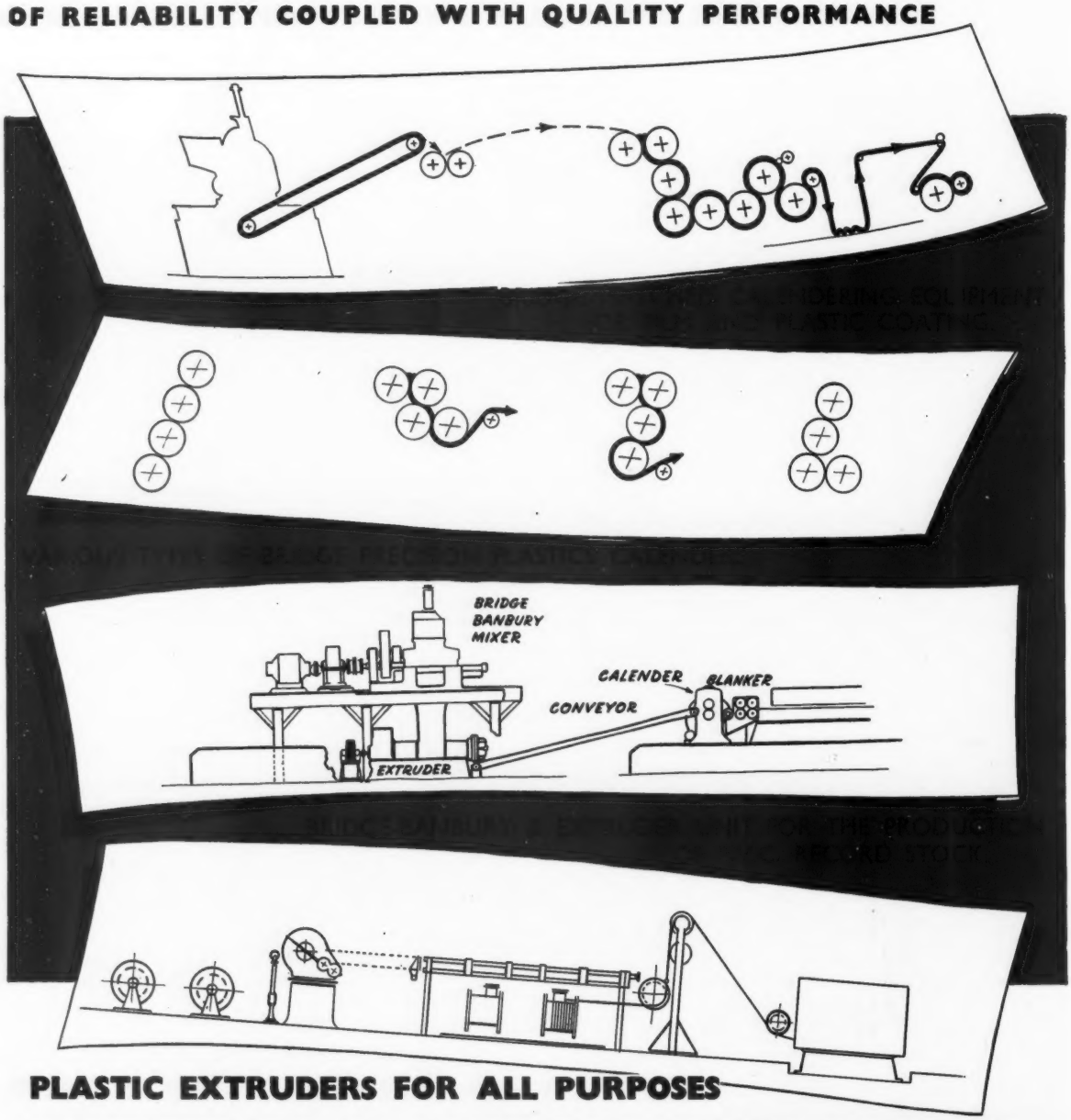
OF RELIABILITY COUPLED WITH QUALITY PERFORMANCE



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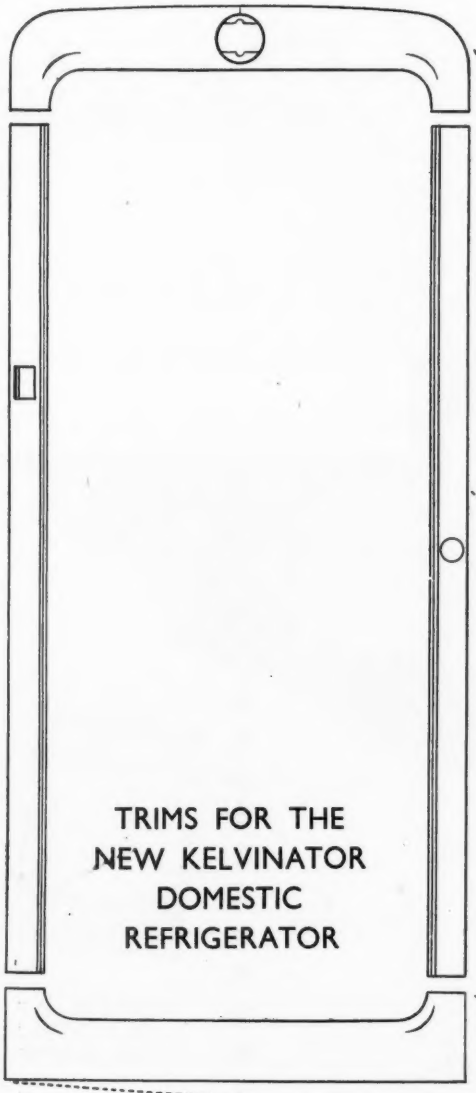

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a trim job was required—

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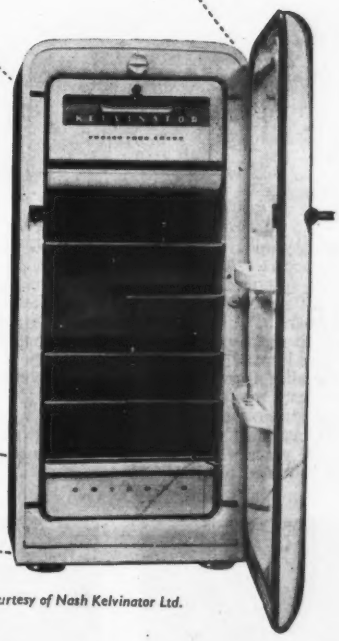

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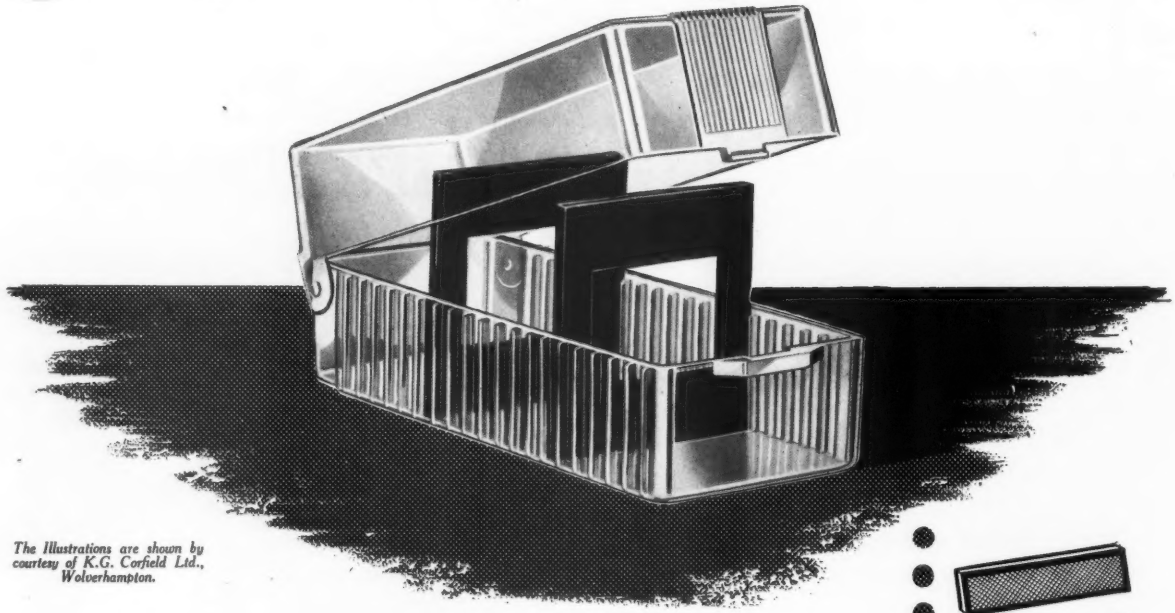
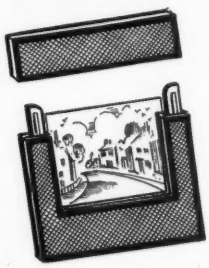


The Illustrations are shown by courtesy of K.G. Corfield Ltd., Wolverhampton.

Never have photographic transparencies been so well protected. Never with such easy access. A box made entirely in plastic—easily opened, securely fastened. Neatly grooved inside, it holds one or up to 20 slide frames safely. It was not at all easy. We had to find the most suitable thermoplastic material—transparent, able to hold its shape despite frequent handling—yet pliable enough to make possible the efficient snap closure as part of the moulding. The finished box is proof of complete success.
And the plastic slide frames also protect transparencies individually. Safe all round but easily removed, simply inserted.
This is another example of what we can do with moulded plastics. Whatever it is you want to make, or make better, we can probably help you; just ask us. For over 30 years we have been evolving new techniques and solving problems with moulded plastics.



DESIGN OF THE PLASTIC SLIDE FRAME

Moulded in substantial section to protect the transparency surface; an internal groove all round to hold it safely. Top of the frame is easily removed, easily replaced—pegs make it a secure assembly. Completely shielded between two pieces of glass, the transparency is perfectly visible. Not an easy ideal—but one we capably achieved.

Some of the machines in our injection moulding works at Summer Lane

One of the three bays in our compression moulding works at Cheapside.

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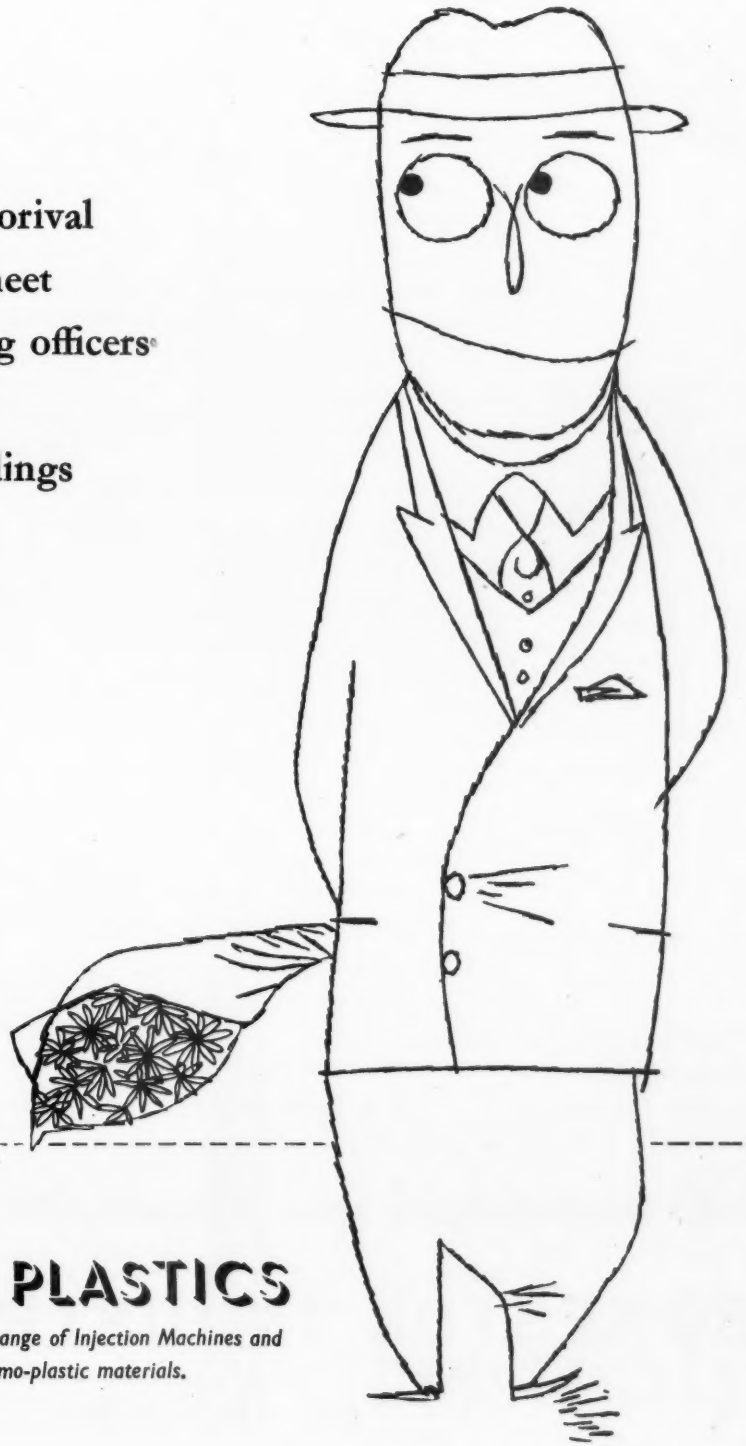

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LORIVAL PLASTICS

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If it's mouldable — Ebonestos can mould it

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MOULDERS IN ALL PLASTIC MATERIALS AND EBONESTOS SPECIAL COMPOSITIONS

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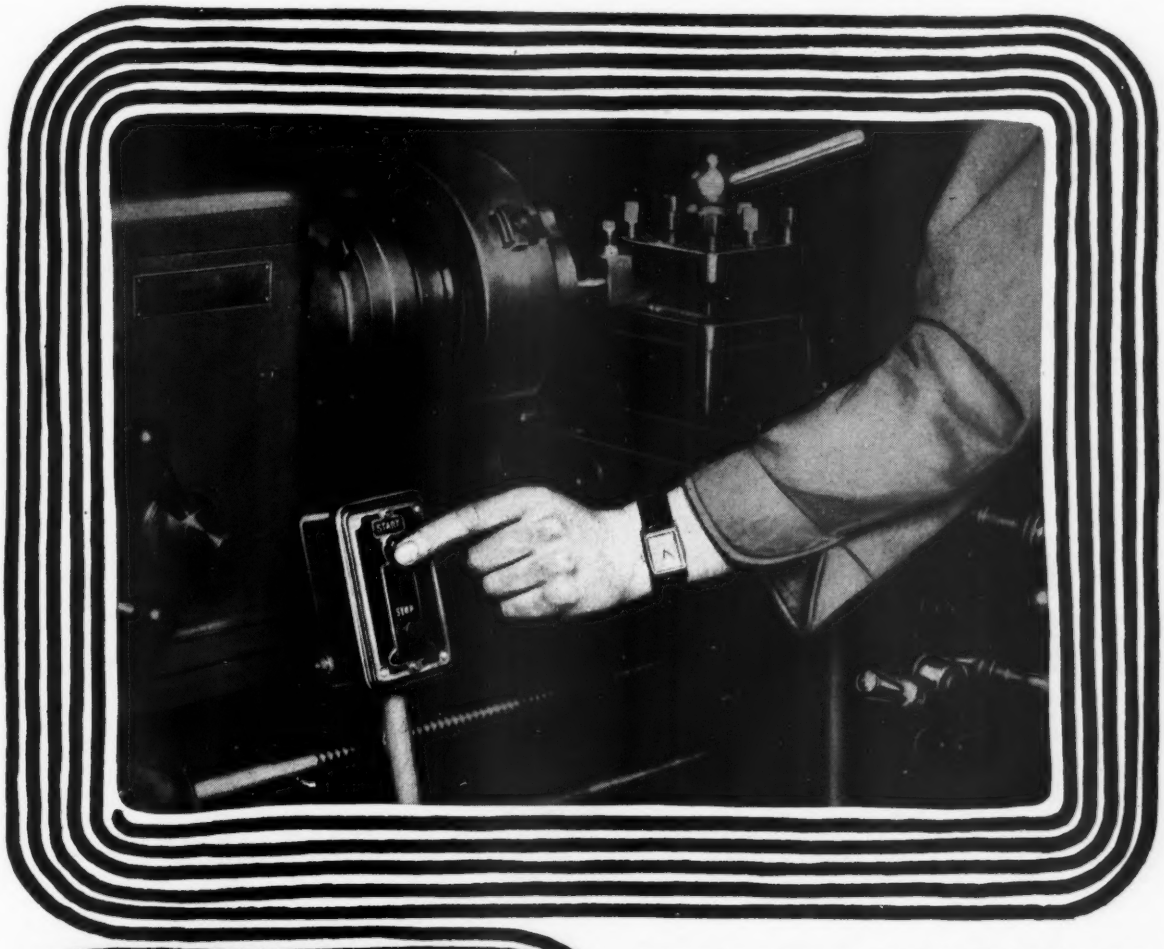

The Finger on the Button

And the eye on the job—the brain too. The machine under the control of a button, the man free to use all his skill. Working without worry, without distraction, a man can work faster, less tiringly.

The machine is a lathe, set up for boring. Accurate work, careful work, but the push button can make it fast work. The hand on the button is symbolic. By freeing skill from unnecessary distractions, electric control speeds up production, raises productivity—and lowers costs and improves accuracy. Push button control is ONLY ONE OF THE AIDS TO HIGHER PRODUCTIVITY THAT ELECTRICITY CAN BRING YOU.

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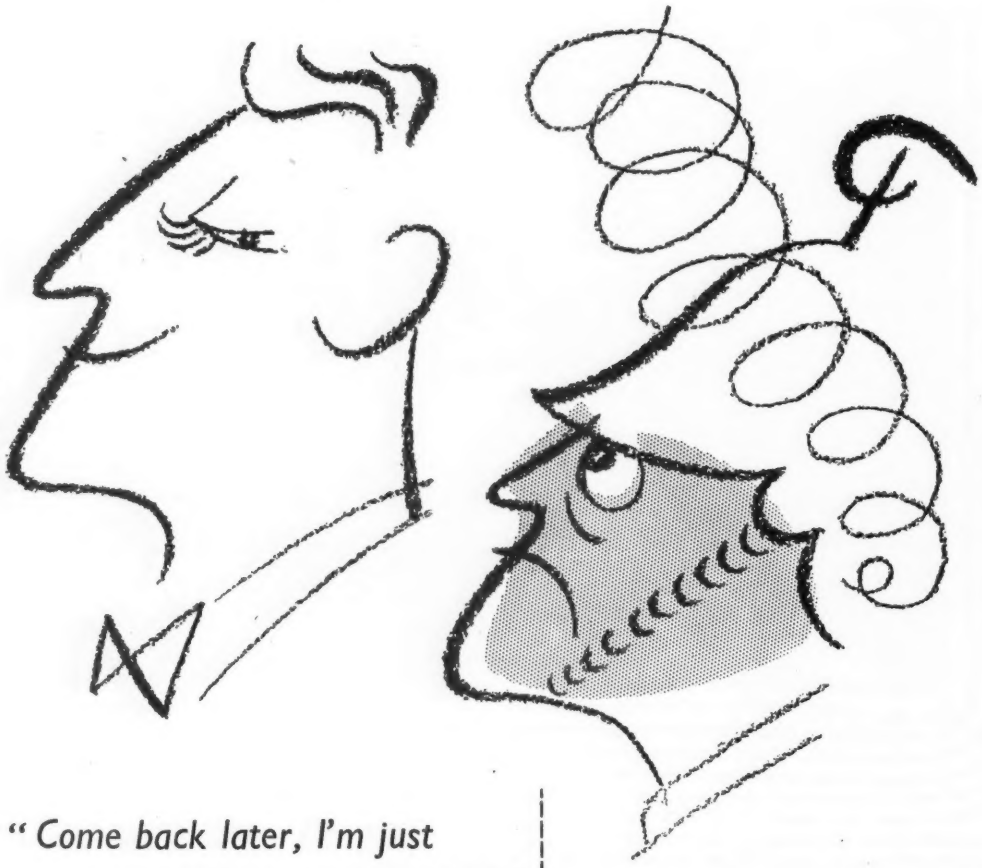
Electricity a Power of Good for PRODUCTIVITY



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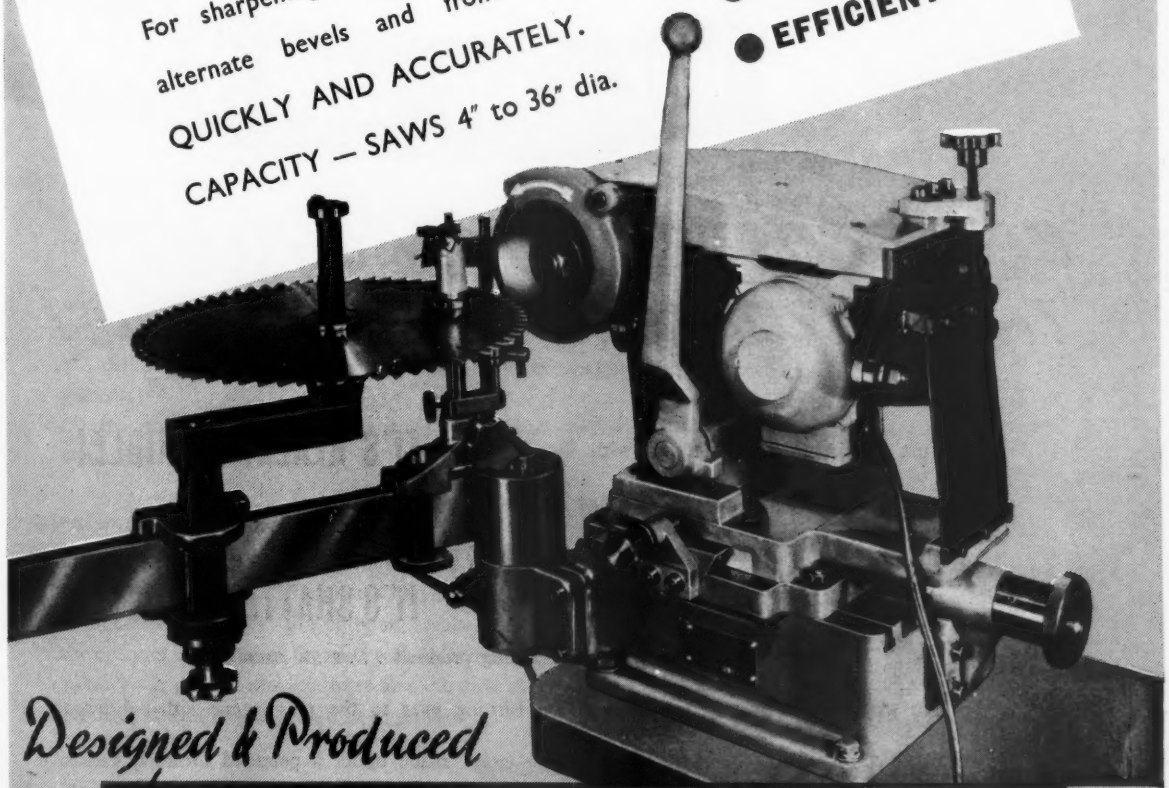

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-like ordinary Polystyrene

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DROP IT!
—it's really tough

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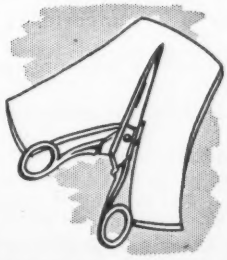

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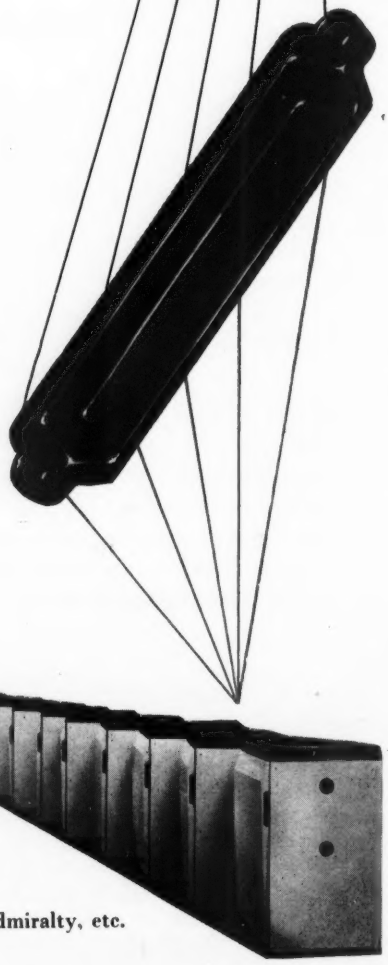

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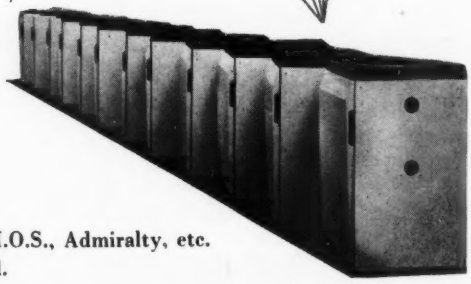

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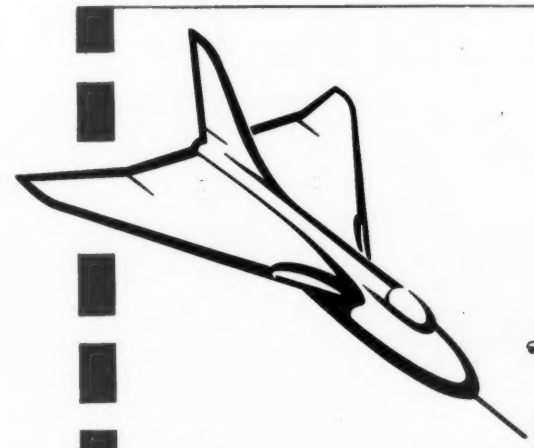
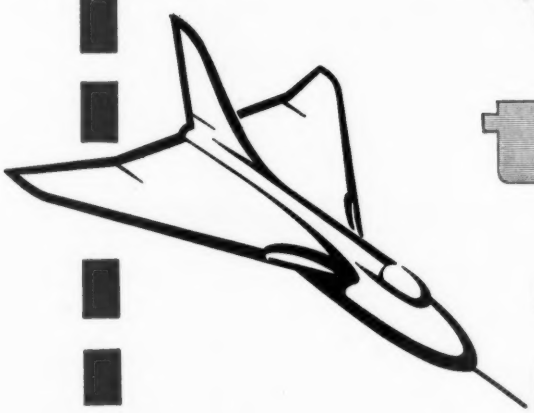


Erinoid

POLYSTYRENE



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STYRON **666 General Purpose** **777 Medium Impact** **475 High Impact** **700 Heat Resistant** **637 Light Stabilised**	For injection and compression moulding and extrusion
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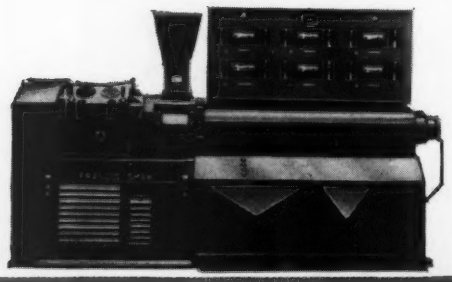

4½" PLASTIC EXTRUDER

The Shaw 4½" Plastic Extruder —one of the Shaw range.

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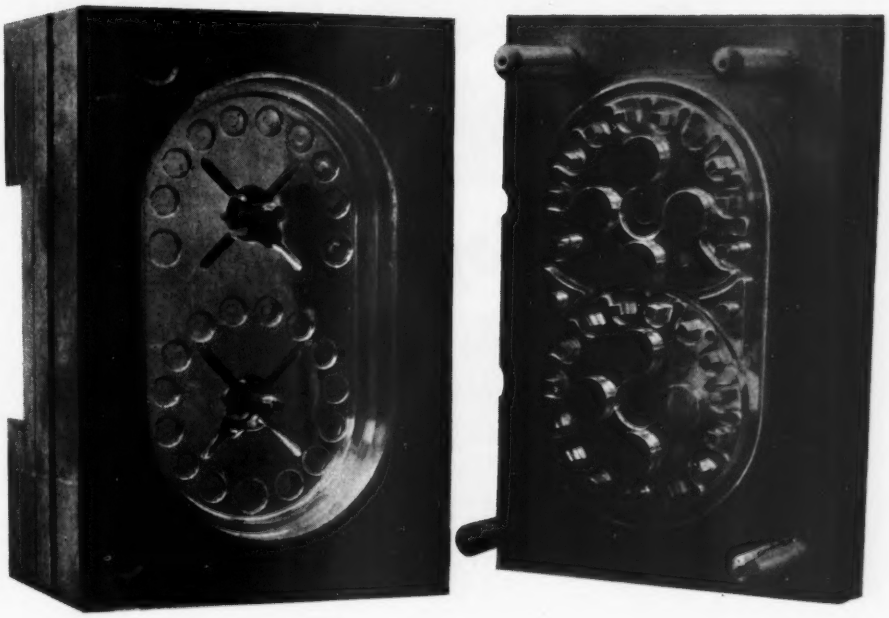

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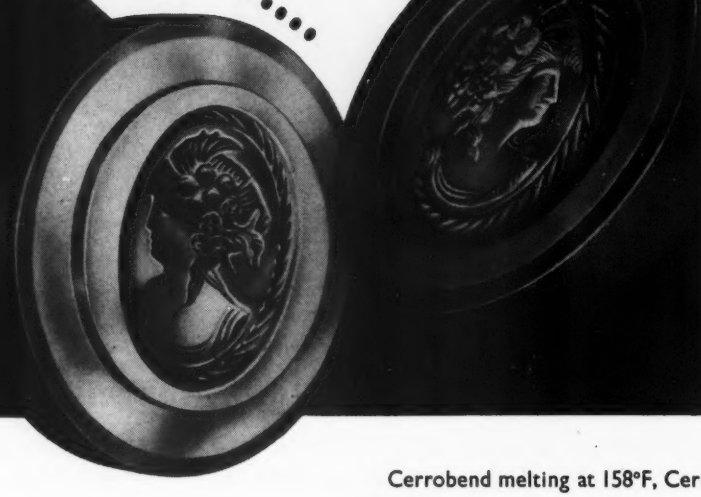

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- *Low power consumption List price £48*

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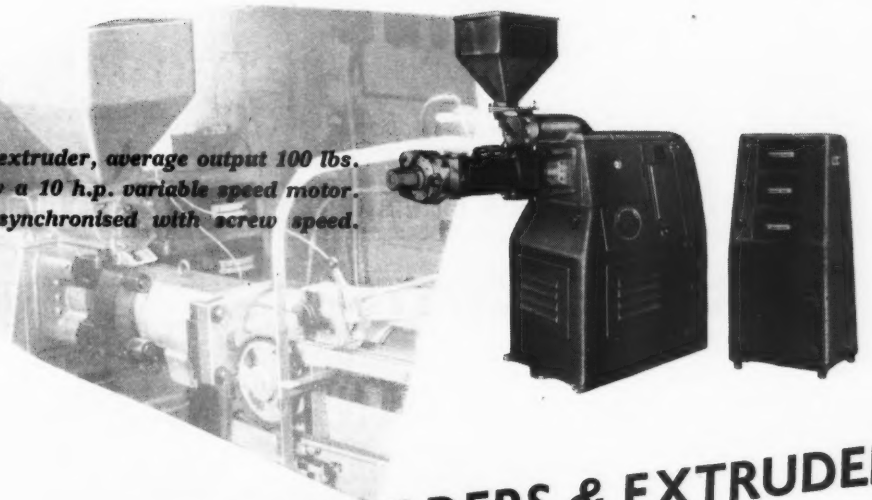

The R.C.100 twin screw extruder, average output 100 lbs. per hour plus, driven by a 10 h.p. variable speed motor. Automatic hopper feed synchronised with screw speed.

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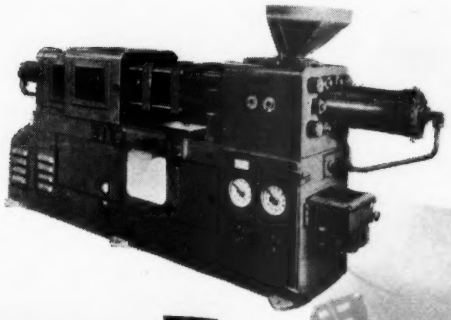
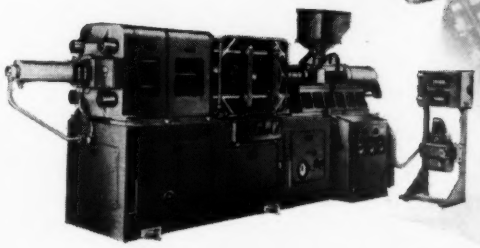
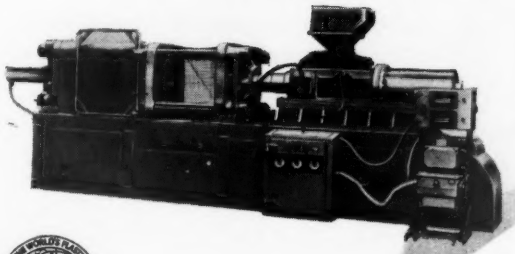


The fully automatic S.H.4 injection moulding machine will produce any article in a wide range of materials up to 4-oz. Mould locking pressure 150 tons. Mould safety device incorporated.



The dependable S.H.8/10 injection moulding machine will produce up to 10-12 oz. per shot. This machine incorporates an hydraulically operated retractable injection unit.



The S.H.16/20 injection moulding machine capable of producing shots up to 20-oz. Automatic cycle control. All moving parts are pressure lubricated.

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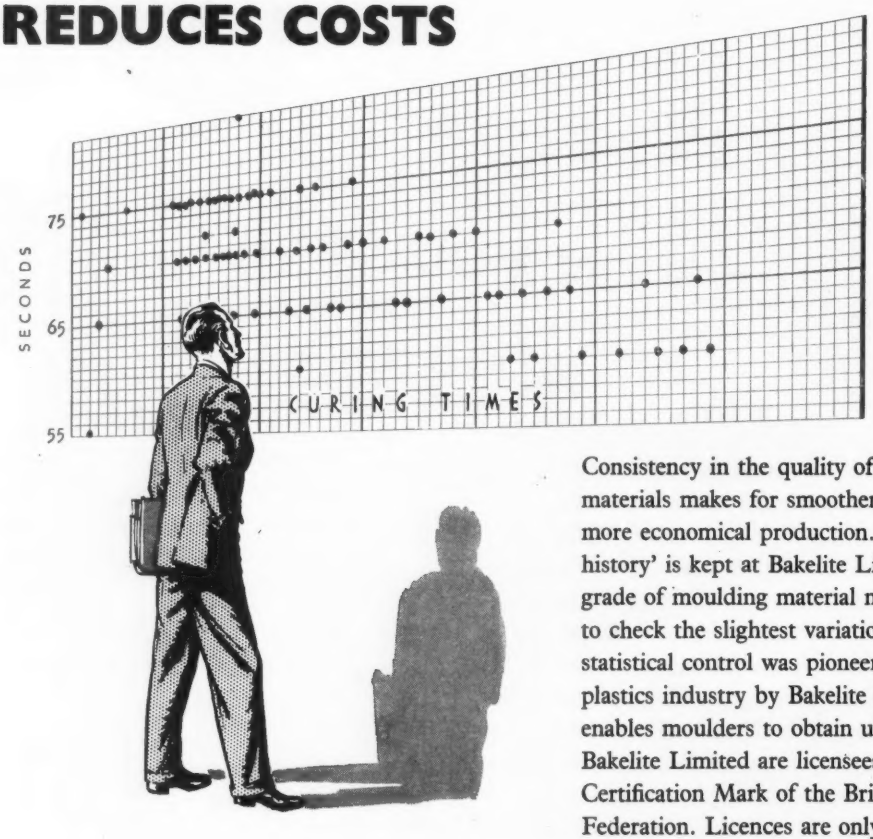

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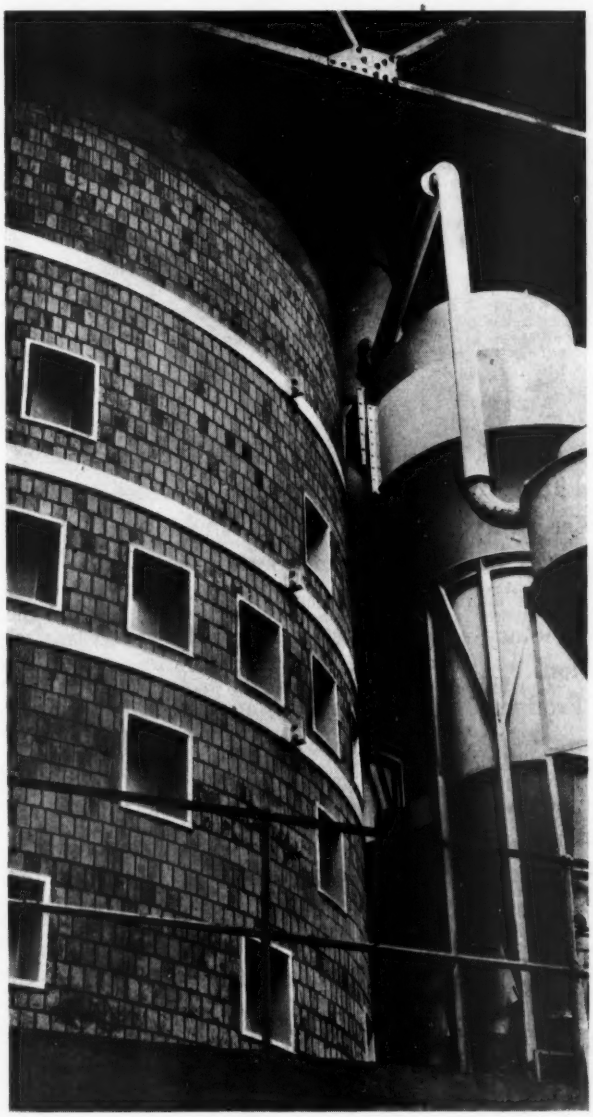

One of the spray driers for urea resins in the No. 2 factory of the Oldbury plant of British Industrial Plastics Ltd.

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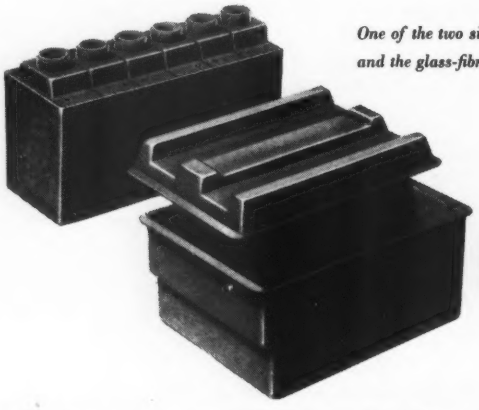

One of the two six-cell polystyrene boxes with its six lids and the glass-fibre polyester resin outer container and lid.

NP

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Plastics

VOL. XIX. No. 204 JULY, 1954

EDITORIALS

Plastic Table Ware

WE may presume without much fear of contradiction in these latter years of grace when the estimation of consumption *per capita* is a common and so-called impressive process of analysis, that each of the 15 million or so families in Great Britain possesses a cup and saucer, and perhaps a plate also, manufactured from plastic materials. This, obviously enough, is very much in the nature of an understatement and few will now doubt the important role of plastic tableware in the home. Overriding advantage is steadily defeating the disadvantages.

It has taken a long time to arrive at the present stage and we can cast our mind back 25 years or more when cups and saucers were first moulded from " phenolics." From their inception they presented one overwhelmingly desirable attribute, their " unbreakability " compared with chinaware and this, above all else, has remained the guiding principle in production, the certainty that it would sway public opinion, in part, away from the hegemony of the thousand-year-old industry. We always shall have so much to learn from porcelain and chinaware—but it can never teach us how to make an unbreakable cup.

Of greater significance than acceptance in the home, in kitchen, nursery and the picnic box, is the fact that in the past few years plasticware has found a lasting place in the catering trade, in thousands of restaurants, milk bars and canteens, where breakages so often assume dimensions of an economic nightmare to proprietors. Moreover, there are few in the plastics industry who are not convinced that we shall get an increasing share of this fantastically large market not merely because of the aforesaid " economics " in the trade but because we are sure that new advances in plastics technology will be made and have their effect.

We have indeed gone a long way in the past 25 years. The " phenolics " quickly gave place to the " ureas," a movement essential because pastel shades were the only acceptable ones (it is interesting to note in this regard that modern styling in certain fields of tableware now demands dark or at least strongly coloured effects); the past 10 years has seen the growth of the " acrylic " type with it superb appearance, strength and lightness that has made it so acceptable in the catering section of air transport and elsewhere, and now, with the emergence of " melamine " ware we have made yet another advance—perhaps the most important to date.

Decoration

One of the wonders the porcelain and chinaware industry has given us in the thousand years or more of its existence is the decoration of its products applied with consumate art and a skilful technology. The process is often slow from the basic clay to the finished miracle of beauty, but so ordered and so efficient has the industry become during the past 50 years that large sections of it are mass-producing without serious loss of high artistic standards.

The plastics tableware industry, on the other hand, may be considered to be, although for very different reasons, at the same stage as early pottery development so far as decoration is concerned—it has never, until very recent times, seriously studied the problem of added embellishment. The plastics industry has more often than not suffered from an *idée fixe*, that mass production should brook no interference of the moulding press and that ancillary processes were taboo.

Happily there are now signs that consideration is being given to the problem. We have noted, particularly from European sources, the profuse use of vivid basic colours of exceptional beauty and perhaps of greater importance the application on a big scale for the first time of designs on both cup and saucer. The efforts so far made are comparatively simple but are of great significance. One example is shown in the photograph on page 228 in this issue of such cups and saucers seen at the recent Hanover Fair, and readers will remember that a similar process is being exploited in this country in the new " melamine " moulding shops of Ranton and Co., Ltd., described in our last issue. The method involves the use of a printed coloured transfer applied to the cup or saucer between primary and final curing. We are seeing here, we fully believe, the beginnings of a movement that may have a profound effect on this section of the plastics industry.

At the moment it is not clear how far the above method will carry us, but at least we have a means of decoration moulded integrally with the cup or saucer—and that in itself is a big step forward.

There will doubtless be other methods to examine. One possible suggestion is somewhat of a parallel to chinaware practice, which applies designs by hand-painting or by transfer, coating with a glaze and finally " baking " or fusing the glaze at high temperature. The parallel for " melamine " or " urea " cups and saucers would be the same method of application of design followed by a varnish spray or dip and then by stoving at high temperatures now commonly used for stoving enamels. It may be questioned whether varnishes can stand up to prolonged or periodic contact with water. This would have to be proved, but the modern alkyd and epoxy resins now available in varnish form and the new methods that promote cross-linking as opposed to traditional oxygen catalysis, result in harder and tougher surfaces of higher resistance to water than was formerly possible. If successful, such a process, using a pigmented varnish, could be employed to resuscitate the " phenolic " cup and saucer.

We should also remember that the lacquered wooden cup, so familiar in China and Japan and not unknown to this country, was coated with a natural varnish found in China and Burma. The surfaces of the vessels so treated are of great beauty and stand up exceptionally well to normal treatment, retaining their brilliance and hardness for very many years.

The First Plastic?

A VISIT to the new Plastics Division of the Telegraph Construction and Maintenance Company at Green Street Green in Kent a few days ago made us ponder on the famous words of Henry Ford: " History is bunk! " Perhaps the fault lies not in history but in historians, for at these works we were forcibly reminded that gutta-percha, a natural giant

polymer and true thermoplastic, was used by the parent company of the present organization, The Gutta Percha Company, in 1845 to make garden hose, picture frames and many other articles and in 1850 to extrude the first submarine telegraph cable, which rather makes nonsense of the books that tell us cellulose nitrate (celluloid) was the first plastic. The company also laid the first trans-Atlantic cable in 1850 and made millions of " gutty " golf-balls from gutta-percha.

Our real reason for visiting the works was to see the great new machine that is being installed for the continuous coating of paper and cardboard with Telcothene (polythene) and that will soon be operating for the packaging industry at the rate of 700 ft./min. It will be fed by the largest extruder in Europe (it has been made by Francis Shaw and Son, Ltd.), with an output of over 600 lb. per hour. The overall weight of the extruder is 13 tons.

We saw also the production of polythene bottles on the most modern injection machines, but, less than 10 yards away, we saw a worker twirling a 10-inch length of heated extruded gutta-percha tubing on a metal rod so that its diameter expanded by this action to be fitted on to a simple cylindrical metal mould, thus producing the body of a bottle suitable for carrying strong acids. The process took but a few minutes, which made us ponder still more deeply. It was the Telephone Construction and Maintenance Company that first developed polythene in the commercial field and today in addition to polythene bottles produces a vast number of extrusions and mouldings in the same material. But more of these works in a future issue of this journal. In the meantime, we offer our sincere congratulations to Telcon and our wishes for a great future.

MOULDING POWDER AND SHOT

A report reached me last month to the effect that " considerable savings in costs are expected from an idea put forward by Mr. G. A. Douse, an agricultural district advisory officer, at a recent meeting of the Canterbury Farmers' Union. It is envisaged that a sprayed-on coating of the cocoon type could effectively be used in thatching haystacks. Browsing through back volumes of *Plastics* I find I wrote way back in October, 1950, in " Moulding Powder and Shot " the following note: " A New Zealand pal of mine, Harry Edwards, of Morcom Green and Edwards, Ltd., Onehunga, Auckland, writes to the effect that he has had numerous requests as to the possibility of applying to hay stacks the ' Operation Mothball ' technique (that is the method of giving machinery, etc., protection from weather with vinyl coatings applied by spray gun). This is by no means a silly idea in principle, for several reasons. The present method of thatching the roof takes a relatively long time, is costly in manpower; furthermore, the race of thatchers in this country, and almost certainly in others, is a dying one —the sons are taking up garage work or nuclear physics! As itinerant organizations are now wandering about the countryside with new mechanical hedge-cutters and road grass-verge trimmers, they might add this service for harassed farmers. Spraying on a plastic roofing to a hay-stack in a couple of hours, instead of a straw thatch in a day or two, might appeal to them."

Good News Travels Slowly

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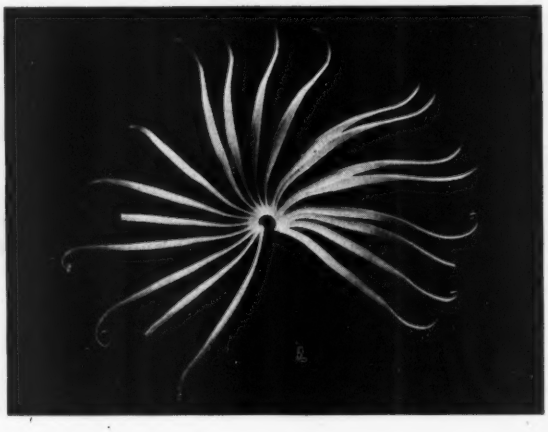
I have recently seen the third annual report of the Women's Advisory Committee of the British Standards Institute, a committee that has done so much excellent work in bridging the gap between industry and consumer. Among its work is the examination of draft standards and so giving excellent advice at the correct stage. I was somewhat perturbed to see in the report one example of the Committee's criticism: " Plastic trays. Here it was felt that the heat-resistance test was not sufficiently severe and that food trays should be capable of withstanding sterilization in boiling water." This, I thought, had little semblance to normal or possible practice. Moreover, it is clearly doubtful that anything less than prolonged boiling would result in satisfactory sterilization. Surely the surface of plastic trays is a great improvement on that of conventional types and more amenable to " perfect " cleaning, especially with modern detergents of very high wetting power. I telephoned the secretary of the Committee regarding the paragraph and was happy to find that it has, in fact, been withdrawn for reasons of impracticability. The secretary, however, was anxious that the Committee should be supplied with all relevant facts regarding the best methods of handling and treating plastics so that it could pass the information on to the associations and institutes it represents.

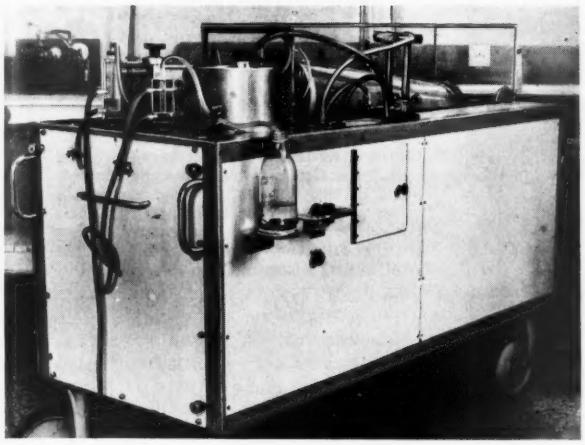
Women's Advisory Committee

◆ ◆ ◆

If I had had the " Thing " I've photographed and show below much earlier in the year, I would have sent it along to the Royal Academy. Hanging from the roof by a copper wire, I think it would have been very effective at an angle of 49° to the horizontal. I have labelled it " Emotional strain of recumbent and recalcitrant female under torque." I think this title very erudite, don't you?—a nice admixture of Freudian-mechanics coupled with a careful choice of adjectives—recumbent female, you note, not lying female, and recalcitrant female not . . . oh, bother, I've forgotten what the word means. And please note it does not represent the female, but the strain and nothing else, portrayed for the first time; hence the genuine centrifugal form common to such strains. It also has a " pool of space," as one sculptor so adequately describes it (it is not a " hole in tummy " as you low fellows would) from which all violent reactions emanate. The whole is redolent of plastic memory (I bet the sculptors don't know what this means!)—a fulfilment of the urge to return to our original egos. By now, you must be getting hot under your collar, so I must confess that the " thing," which is quite unique, is the extraordinarily fortuitous result of turning a rod of polythene (obviously the tool had high-speed hiccups). It's a pretty thing in its way, and I feel it could be reproduced by working the cutting tool with a cam. DOGSBODDY.

Plastic Art Form





Mechanical Heart-lung Uses Plastics

Recently we were privileged to visit the Surgical Department of the Postgraduate Medical School of London to see a major development in surgical technique, which, under the guidance of Professor Ian Aird, has been carried out by Dr. D. G. Melrose.

Fig. 1.—General view of heart-lung unit.

SOME years ago the Department of Surgery of the Postgraduate Medical School of London was concerned with research in the pumping of fluids through the circulatory systems of isolated human organs. After a short investigation in the field it seemed that a machine to undertake the whole function of heart and lungs in a patient subjected to intra-cardiac surgery was not then an immediately attainable aim. The aim, therefore, became to devise an artificial heart-lung machine which could be used as a form of "assisted circulation." After a period of four years, Dr. Melrose has devised an apparatus which may now be justifiably and humanely applied to certain varieties of anoxia, that is, lack of oxygen, and circulatory failure in man. The notes and photographs which follow throw an interesting light on the use of plastics materials, principally polymethylmethacrylate, in the development of this machine, a general view of which is shown in Fig. 1.

The basic principle of the mechanical heart-lung, or oxygenator, is that blood withdrawn from the patient should be charged with oxygen and afterwards pumped back into the vascular system. Certain conditions must be observed for the successful operation of such a unit, principally that the mixing of the blood with the oxygen should be complete, that the methods of mixing should not impede smooth and rapid flow through the machine, that foaming of the blood (see Fig. 2), if it occurs, should not interfere with the efficient operation of the machine, that the apparatus should be capable of being completely dismantled for effective cleaning and that, for ease of maintaining sterility, a system as nearly closed as possible is maintained.

The oxygenator is essentially a rotating cylinder set at a slight angle to the horizontal, Fig. 3. Within it the blood travels under the influence of gravity from one end to the other, being spread over a multitude of surfaces formed by plates projecting into the lumen of the cylinder. These plates are arranged in the cylinder somewhat in the form of an Archimedean helix. This analogy is not strictly accurate but may clarify the method of construction, which is, in fact, carried out in the following manner. A cylinder of Perspex 30 in. in length and of internal diameter of 8 in. is free to rotate in its long axis while supported on rollers at 20° to the horizontal. It is closed at each end by an end-plate of Tufnol 10 in. in diameter. In this cylinder annular plates of 1/24 in. Perspex, with an overall diameter of $7\frac{7}{8}$ in. and an internal diameter of $4\frac{3}{8}$ in. are separated from each other by annular washers. These washers have the same external diameter as the plates, but an internal diameter of $5\frac{3}{8}$ in. They, too, are constructed from Perspex, $\frac{5}{16}$ in. thick. The holes in the plates are concentric (Fig. 4), but the holes in the washers are cut eccentrically, the centres of the holes being 1 in. from the true centre of the washers. These plates and washers are mounted in the cylinder on chromium-plated rods (Fig. 5) and are freely detachable for cleaning. A maximum of 76 plates and their separating washers may

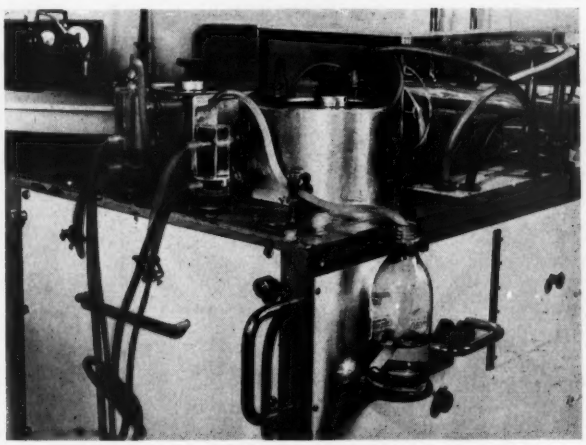


Fig. 2.—This view shows use of polythene and p.v.c. tubing. At left centre can be seen the acrylic bubble traps.

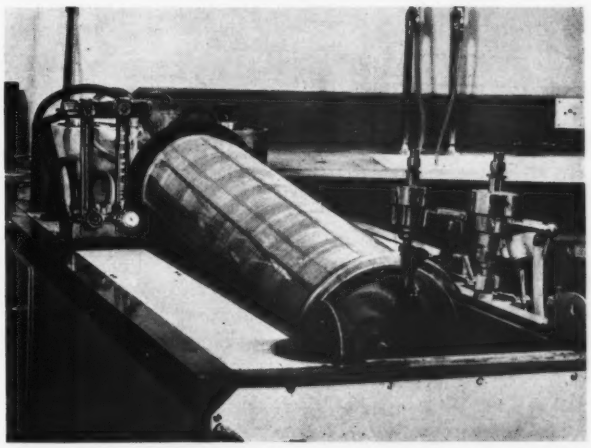


Fig. 3.—The oxygenator cylinder, mounted at an angle, is positioned over a heating unit which maintains the blood at a constant temperature.

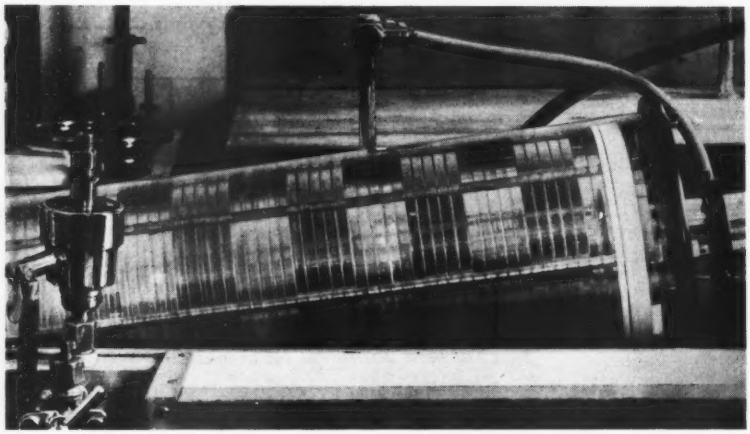


Fig. 4.—The plates are fitted so that their central holes form a cylindrical cavity, coaxial with the enclosing cylinder, but the arrangement of the washers between each plate varies with each group of five, so that their central holes are not in alignment. Thus the blood is evenly spread over the exposed surfaces of the plates.

be used to provide a surface area of approximately 1 square metre. The juxtaposition of the plates (Fig. 6), supported by the washers, creates a large gas-liquid interface, thus enabling the blood, spread out in the form of a thin film, to be exposed to the oxygen. An important feature of the design of the oxygenator is the arrangement of the centre holes of the washers in relation to each other. As can be seen in Fig. 4, the washers are fitted together in batches of five, between each washer being a plate, the washers having eccentrically placed holes. The axis of the holes in the washers is moved slightly for each batch of five so that a screw system is created within the cylinder which permits the passage of the blood down the cylinder, by gravity.

Due to the difficulty of steam sterilizing the thin plates of Perspex, experiments are now being carried out towards the manufacture of a new lung to be fabricated from polytetrafluorethylene (p.t.f.e.). Experimental plates and washers can be seen in Fig. 4 at the upper end of the cylinder.

The use of plastics does not end with the lung itself, since Perspex rod has also been used in the fabrication of the units which can be seen in Fig. 2. Fabricated from 2¼-in. and 1¼-in. diameter rod, they act as bubble traps and also permit the visual inspection of the blood immediately prior to its being passed to the patient. Within these units are Perspex blocks, which can be withdrawn for cleaning purposes, which act as temporary barriers to the passage of the blood and thus assist in the elimination of bubbles.

Polythene and p.v.c. tubing is used extensively on the machine. Neither of these materials is wetted by water, nor are they toxic, and both can be steam-sterilized.

All of the Perspex fabrication for the present machine was carried out by members of the staff of the Postgraduate Medical School with the exception of the outer case of the lung, which was made by Richard Daleman, Ltd., of Latimer Road, Hammersmith, London. With the construction of the new unit now in hand, Visijar Laboratory Supply Co., Ltd., are concerned with the fabrication of plates and washers, both in Perspex and p.t.f.e.

Fig. 5.—Close-up view of cylinder with Tufnol end-plate removed. The dark shadow within the cylinder is cast by the experimental plates of p.t.f.e.

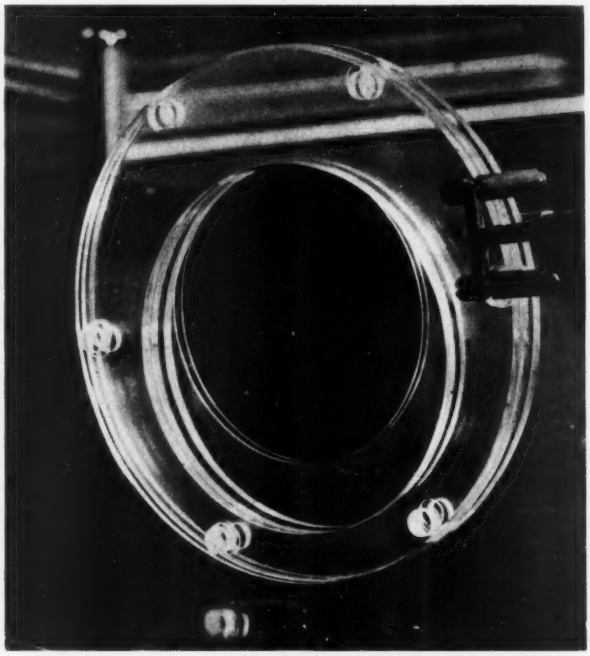


Fig. 6.—Here can be seen three plates with two washers spaced between them. This picture clearly shows the eccentric centre holes of the washers.

Mould Making by Spraying with Low Melting Point Alloys

Some notes on a new method of producing moulds rapidly and at low cost. In general such moulds are suitable for short runs and for low-pressure, low-temperature work

THE tool-room for producing high-quality, high-precision moulds has often been termed a bottle-neck for the bulk of the plastics industry, since cost is high and time for making them is long, terms which are almost synonymous. The high-precision work requires costly tools and highly-skilled workers; the process is necessarily slow to achieve the type of mould required for use with very high pressures and for the supreme accuracy essential in high-quality production over long periods.

However the term " bottleneck " is regarded, and whether cost or time lag in production is the most important (the period 1948-1951 clearly provided an example of exceptional mould demand by the industry with greater anxiety over delivery dates than over costs), the position in normal times has always raised hopes in the minds of almost all technicians in the moulding industry that other methods would be found to supplement the machining process. More specifically, an urgent demand has always been in existence for cheaper and more rapidly produced moulds and dies to satisfy the producer of small units in short runs or alternatively where supreme accuracy was not of first importance and where the mould of cast non-ferrous metals of the softer type were considered inefficient.

As a " half-way house " many hopes were placed some years ago on the cast-steel mould but the difficulties in producing completely air-free castings has caused much of the work in this field to cease. This is a pity since some of the moulds successfully produced were of exceptional merit and originally gave promise of cheaper moulds more rapidly produced.

Of the processes of more direct and immediate interest we may refer in passing, before discussing the method referred to in the title, one method established in this country some 11 years ago: that of producing mould cavities by " electro-forming," that is, by electro-deposition of nickel on to a reproduction of the job to be moulded and of backing up the shell so formed and of holding the structure in a rigid frame-work. This process has rightly resulted in considerable and increasing success.

Mould Making by Alloy Spraying

The most recent process to come within the plastics purlieu of low-cost and rapid production lies in an entirely different field of operation and owes its origin to the experience gained in the aircraft and general engineering industries, where large shaped light alloy units have long been produced from sheet using dies made from cast low melting-point alloys based on bismuth metal, and where the same alloys were also widely used for metal tube bending, die and punch location and so on. The knowledge gained therefrom regarding the strength properties of the alloys under many conditions and the well-known facts that not only could they be readily and almost entirely recoverable from discarded tools by low heating for re-use, but also that they could be sprayed in the fluid form, opened up the possibility for simple and rapid mould production. The work in this field, originated by Mining and Chemical Products, Ltd., has now reached an interesting stage worthy of close analysis.

The low melting-point alloys used in the above wide fields are selected according to requirements from four types. All are based on bismuth metal alloyed with one or more other metals: lead, tin and antimony, giving a range of melting points 158° F. (70° C.), 255° F. (124° C.), 281° F. (138° C.), and 288° F. (142° C.) respectively, hardness and dimensional

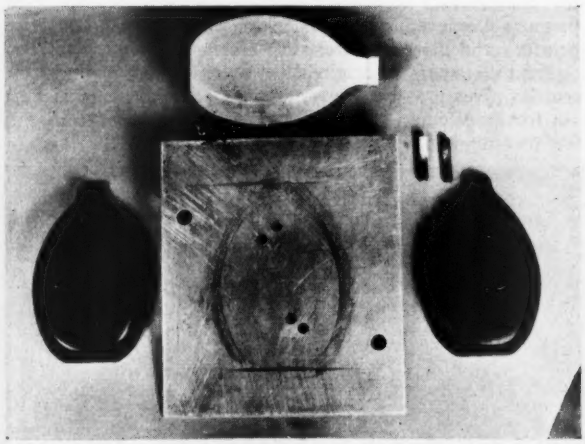


Fig. 1 (above).—Positioning template, with wooden patterns on either side, and moulded bottle above.

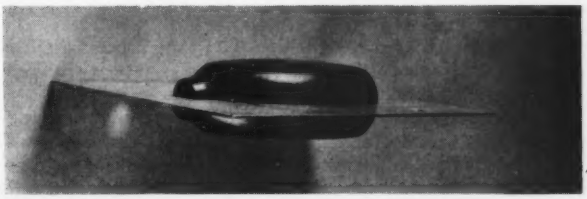


Fig. 2 (right, above).—Template with wooden patterns in position.

Fig. 3 (right).—Holding the template in the left hand, the operator is applying a fine metal spray with the gun held in the right hand.

Fig. 4.—The finished mould ready for assembly in the moulding machine. The dowel pins can be seen on the right. The type of finish possible is also clearly shown. As will be seen, once the sprayed metal shell has been produced, it is a simple matter to mount it in a metal chase backed by more alloy, either sprayed on or poured from a ladle.

accuracy increasing with rise in melting point. It will thus be seen that fluidity for spraying can be simply achieved and maintained, and with an adequate spray gun, spraying can be controlled to achieve a fine mist, the particles of which enter the smallest of crevices to reproduce them with great fidelity.

Of the above four alloys neither of the two melting at 158° F. and 255° F. respectively are dimensionally stable, for both exhibit measurable growth after solidification when they are cast or sprayed, resulting in a tendency to warp. Although it is possible to correct this by subsequent pressure treatment, they are not recommended for high-quality work. The alloy melting at 281° F. shows very slight initial expansion followed by a small contraction resulting in a final expansion of about 0.0004 in. to 0.0005 in. per inch. The best results are obtained with the alloy of melting point 288° F. which shows almost complete absence of dimensional change, and which is employed in the production of the two moulds described and illustrated here.

As for the master patterns employed in the process the use of metal is advantageous where a polished surface is required but non-metallic materials which can be cast or otherwise reproduced with a high polish such as phenolic, polyester and epoxy resins can also be employed. In actual practice it has been found that the latter are often superior to metal patterns in being able to retain the sprayed alloy with greater efficiency.

We have been able to examine the process of this type of mould making in greater detail at the works of Fibrenyle Ltd., the well-known manufacturers of " Skylon " polythene bottles. The pressure used in this type of mould is low—of the order of 40 lb. per sq. in.

Fig. 1 shows one type of bottle made at the factory and two wooden formers or patterns each a replica of half the bottle. (Note: the moulds shown in Fig. 4 were actually produced from solid aluminium patterns to obtain the high finish desired; the wooden patterns were used here merely to obtain a photographic contrast between pattern and sprayed metal.) The patterns are first secured to a metal plate by pins (see Fig 2) and in the case of wood are treated with graphite to get a higher polish on the surface. Polished metal patterns need no parting agent whatsoever.

Fig. 3 shows the type of spray gun employed,* the alloy feeding hopper being electrically heated; the flow of alloy to the compressed air stream is controlled by an adjustable needle in the feeding hopper.

Spraying is carried out in a manner similar to that of paint spraying, the movement being fairly rapid to secure comparatively even and very thin consecutive layers. After the thickness of about $\frac{1}{16}$ in. is obtained, a coarser spray may be used for more rapid building up until the desired thickness of about $\frac{1}{8}$ in. is produced.

The two shells are then easily separated from the pattern and template and incorporated in a chase. At this point it may be noted that it is a simple matter to incorporate at the rear a spirally wound copper tubing to achieve rapid cooling and embedding by further spraying or dripping of alloy from the gun or by pouring molten alloy from a ladle. The two ends of the tube are brought out through the retaining walls of the mould for connection to a water supply and drain. Fig. 4 shows the completed bottle mould, the finish on the surface being quite adequate for the purpose in view. Thousands of bottles have been produced from the mould which was made in the works in 21 working hours for an all-in cost of about £50. Another advantage is that when discarded because of deterioration or obsolescence the alloy can be heated and recovered for further mould-making almost in its entirety. Another typical mould is shown in Fig. 5.

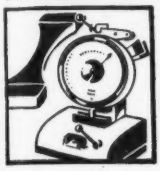
For very obvious reasons this type of mould cannot be used for compression work at the high temperature and high pressure employed nor for injection moulding at low temperature and high pressure, although in the latter field it is claimed that some success reached by chromium-plating such moulds, gives promise. Investigations are also being carried out for the vacuum forming of thermoplastic sheet using the low melting-point alloys as formers.

Fig. 5.—This half of a mould cavity was made from a shell and shows the detail of finish that is obtainable with this technique.

*Manufactured by R. E. Pickstone, Ltd.

World's Industry Employs Plastics

MATERIALS and TESTING



Thermal stability of Teflon.—Recently at the National Bureau of Standards a systematic study of a series of fluoropolymers including Teflon was completed, determining their thermal stability, rates of thermal degradation and the nature and relative amounts of products given off.
(*Technical News Bulletin* (*Nat. Bur. Standards*), 1954/Mar./43.)

Testing of foils.—A draft standard, DIN 53370 (March, 1954), has been published dealing with tests for determining thickness. The specific measuring pressure should be between 0.25 kg. per sq. cm. for soft foils and 3.0 kg. per sq. cm. for hard foils; for very soft foils the thickness should be measured by methods without pressure, e.g., optical methods.
(*Kunststoffe*, 1954/Apr./160.)

Porous plastic.—F. Stastny describes a porous polystyrene developed under the trade name "Styropor." It can be easily processed and has many useful applications. The present article describes the manufacturing problems for the material in solid and granular form.
(*Kunststoffe*, 1954/Apr./173.)

Polystyrene beads.—A foam-type plastic is produced from tiny hard beads of polystyrene impregnated with a special foaming agent which reacts under heat. The material has been developed by Research Department of Koppers Co. Inc.
(*Product Engineering*, 1954/Apr./205.)

New polyester film.—A new film, either transparent or translucent, has the high strength of 25,000 lb./sq. in. and both heat and corrosion resistance. It will soon be in large-scale production and will find many electrical applications.
(*Materials and Methods*, 1954/Mar./104.)

New structural plastic.—Components made of "Lockfoam" are said to have a high strength to weight ratio and marked resistance to moisture and corrosion. It is applied in the form of a syrupy fluid and can be cast into cavities or forced through apertures; pressure can be directly applied or through vacuum. Besides rubber-like flexible components, parts with great rigidity can also be obtained.
(*Machinery* (*Lond.*), 1954/May 21/1085.)

Casting plastics.—J. R. Charlton points out that small and large-run production of electrical and mechanical assemblies can often be speeded up with cast plastics. Typical materials, their properties and applications are described.
(*Machine Design*, 1954/May/127.)

Fire retardant polyesters.—A range of three experimental resins for general and special applications has been developed by Interchemical Co., 67 West 44th Street, New York, U.S.A. IC-594FR resin is self-extinguishing and suitable for general purpose moulding. IC-636FR is self-extinguishing and has higher chlorine content than IC-594 permitting dilution with general purpose resins to control flammability. IC-670FR combines self-extinguishing characteristics of IC-594 with air cure properties.
(*Materials and Methods*, 1954/June/148.)

Nylon Cement.—A high strength non-brittle cement called Nylaweld for bonding nylon mouldings has been developed by the Polymer Corp., of Reading, Penn. Resulting bonds are claimed not to degrade under prolonged exposure to boiling water or boiling concentrated aqueous alkali solutions. Tensile strength is said to be only slightly less than the strength of nylon.
(*Materials and Methods*, 1954/June/158.)

INDUSTRIAL APPLICATIONS

Metallic plastic for drill jigs.—A new material, "Devcon" is putty-like in consistency and composed of fine steel powder and a very strong plastic. It is worked like modelling clay, applied to a flat metal plate, the desired model is pressed into the mass. In about two hours the mass is hard; no heat or pressure is required. After curing the material is very strong, rigid and tough.
(*Tool Engineer*, 1954/May/127.)

Dies.—G. C. Adams gives an up-to-date review of the techniques for producing plastics dies and how tooling costs are being reduced.
(*Tool Engineer*, 1954/May/79.)

Automobile bodies.—It is shown by way of example how styling developments are facilitated by using plastic bodies first styled from plaster moulds.
(*Autom. Industries*, 1954/May 1/48.)

Plastic fixtures.—B. Sokol in a paper to 22nd A.S.T.E. annual meeting indicated the wide use of plastics in modern tooling. He deals with polyesters, casting phenolics and epoxies and recommends plastics, in particular, for hand-manipulated tools owing to their lightness.
(*Tool Engineer*, 1954/Apr./69.)

Corvette plastic body.—Detailed information on the production of the body of this new American car, given by E. J. Premo, includes data on the assembly.
(*Tool Engineer*, 1954/Apr./258.)

Applications of fluorocarbons.—Owing to their high toughness and strength from temperatures below zero to over 300° F. and good electrical and physical properties, these materials have found applications from insulation for high-temperature hook-up wire and nitric acid filtering media to oil gauge glasses and human eyeball replacement.
(*Machine Design*, 1954/May/147.)

Cellular polythene insulator.—TV lead-in cables incorporate insulation of solid polythene around the core of Bakelite cellular polythene. The foamed insulating material reduces picture distortion.
(*Materials and Methods*, 1954/June/116.)

Gears of laminated beechwood.—P. N. Chuchrjanski, Prague, describes the manufacture and use of noiseless gears of laminated beechwood as used in textile factories.
(*Fertigungstechnik*, 1954/Apr./173.)

Threaded inserts.—New inserts threaded inside and outside have a radial recessed nylon plug which is compressed from both the inside (bolt) and the outside (housing) thread and therefore exerts a positive locking action. All locking action is on the thread; inserts may be re-used.
(*Machine Design*, 1954/May/226.)

Silicone rubber.—G. W. Painter deals with these materials from a design point of view. In general, silicones cannot be substituted directly for such elastomers as natural rubber and neoprene in a given design.
(*Machine Design*, 1954/May/308.)

Silicone rubber for cable insulation.—Several typical silicone rubbers are reviewed briefly, demonstrating the improvements made during recent years. A new silicone rubber with a fumed silica as filler is described. It gives best electrical properties, is stable over a wide temperature range, and it is not affected adversely by moisture, corona, weathering or ageing at high temperatures.
(*Wire and Wire Products*, 1954/May/516.)

Polyethylene for large structures.—Polyethylene is now being introduced for structural applications in welded units, primarily where lightness in weight and corrosion resistance are required.
(*Product Engineering*, 1954/Apr./146.)

MISCELLANEOUS USES

Crazing in polystyrene parts.—Failures and poor appearance caused by crazing can be eliminated by good design. Data has been given on causes of crazing by heat, light, and organic materials and by internal stresses; suggestions are made for overcoming defects.
(*Materials and Methods*, 1954/June/93.)

Automatic engraver.—The Scan-a-Graver automatic half-tone printing plate engraving machine is being imported by J. F. Crossfield, Ltd., London, representatives for Fairchild International S.A. The plastic plates used with the machine are to be made in the U.K.
(*Printing World*, 1954/Apr. 2/385.)

Silicones.—T. A. Kauppi gives a survey on developments during the past year during which several important materials have been added to this family.
(*Machine Design*, 1954/May/184.)

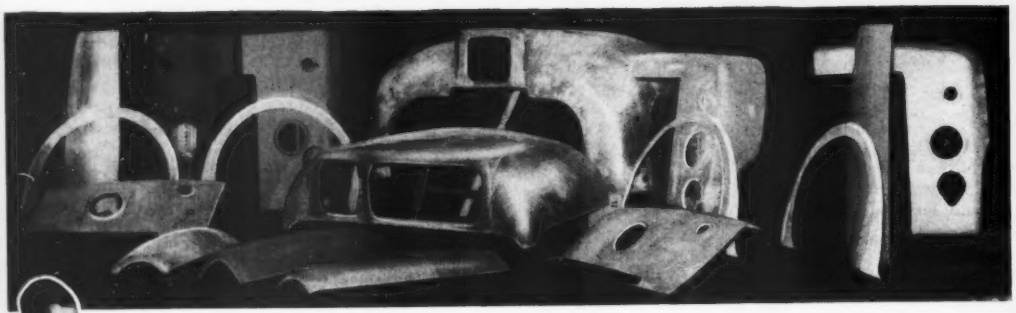
Foamed vinyls.—R. A. Calsibet gives a survey on applications of foamed plastics.
(*Machine Design*, 1954/May/163.)

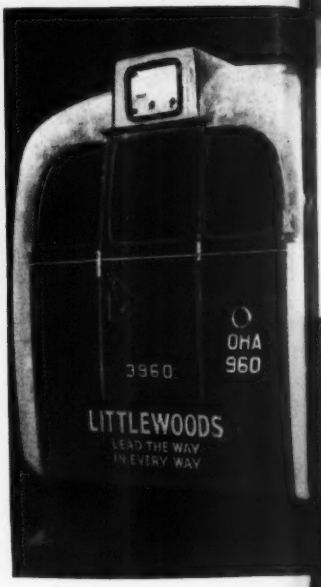
PLASTICS
IN THE SERVICE OF MAN

A pictorial review of high-quality units moulded or otherwise fabricated in Great Britain . . .

49. Commercial Vehicles—2

A list of trade marks and companies mentioned in this review, with full names and addresses, appears on page 237.





(Above, left and right) Panels and components of polyester resin bonded glass fibre are currently replacing aluminium panels on buses of Birmingham and Midland Omnibus Co., Ltd. They are light in weight, durable and more cheaply produced than metal parts. 300 new buses will have all panels made of reinforced plastics. The two photos (right) show plastic panels being fitted to a bus.

PLASTICS
JULY, 1954

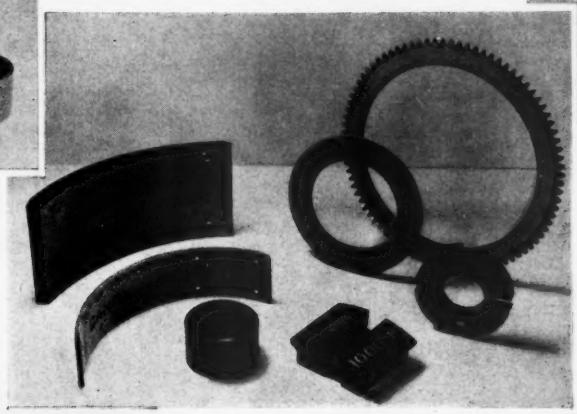
(Right) Transparent Perspex acrylic sheet, tough and virtually shatter-proof, is used for the canopy of this Allis-Chalmers bulldozer. The canopy was made by Dormer Domes.

(Above and right) Curved Perspex acrylic panels are used for the quarter-lights of this coach built by Duple Motor Bodies Ltd. They are light, transparent, tough and easily shaped.

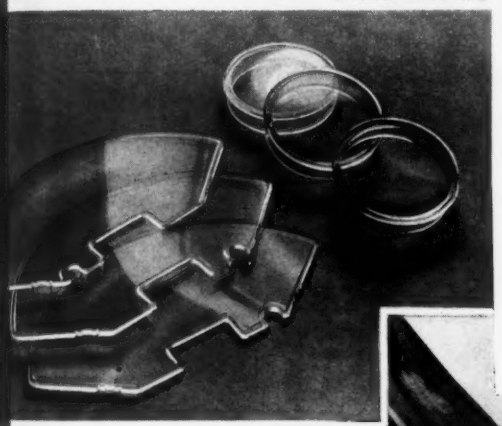
(Above) Resin-bonded asbestos rings and bushes are produced by Ferodo Ltd., for use on brakes, clutches, injector pumps and exhaust couplings.

(Right) Combined rear light and stop-light lenses are fabricated from transparent red celluloid sheet by General Celluloid Co., Ltd.

(Below) Resin-bonded fabric and asbestos components moulded and fabricated by Gandy Ltd., are employed in the construction of motor vehicles as brake and clutch linings, bearings and bushings.



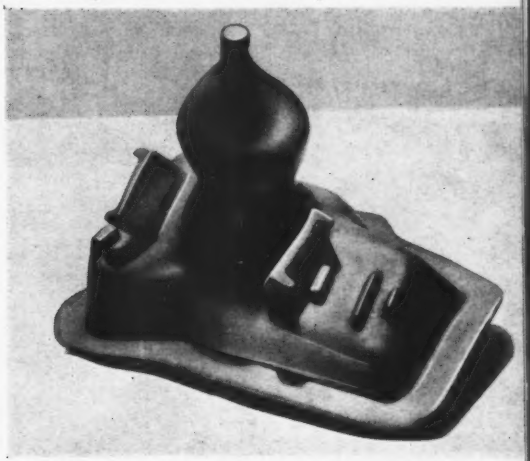
(Below) This gearbox cover is one of the largest examples of dip moulding from p.v.c. paste, carried out by Hellermann Ltd. It measures 15 in. by 12 in. by 12 in. high and weighs 2½ lb.

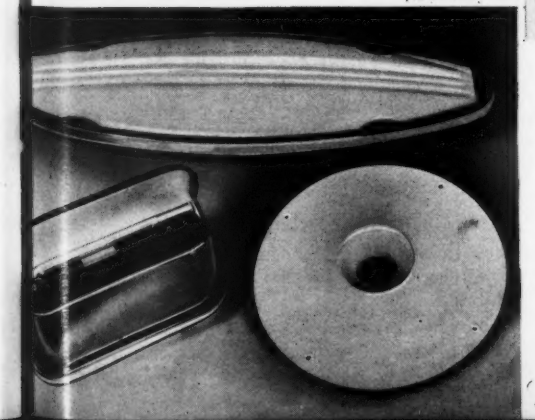


(Above) These dial screens for an instrument panel are moulded from clear transparent Diakon acrylic material by Injection Moulders Ltd.

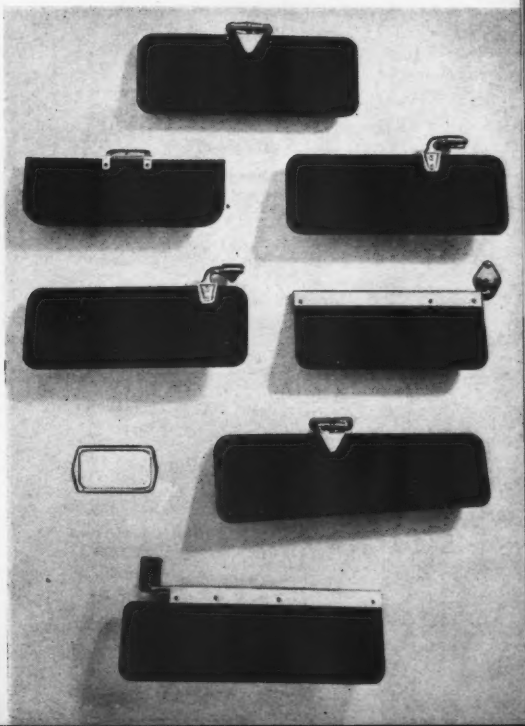
(Below) Plastic components made by Wilmot Breeden Ltd., include coach roof lamp with Perspex lens and phenolic bulb holders (top), coach ashtray with Bakelite phenolic container (left) and bus lamp with Bakelite phenolic bulb holder and urea reflector (right).

(Below) Close-up of cable loom harness junction made by Hellermann Ltd., by welding extruded tubing to dip-moulded joints. A complete cable loom harness was shown last month (*Plastics*, June, 1954, page 194.)



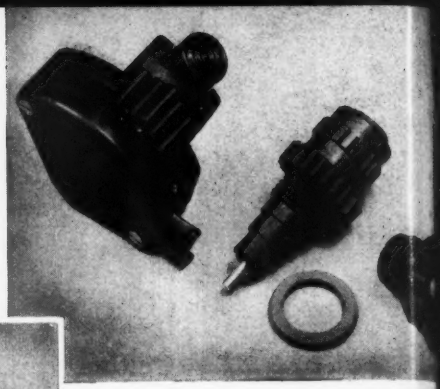


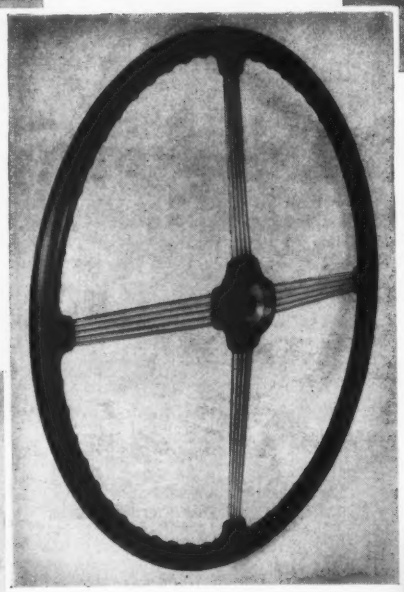
(Right) Coloured Perspex acrylic sheet is employed by Wilmot Breeden Ltd., in the production of sun visors.



(Above) Charging plug components for use on B.E.V. electrical trucks are moulded in Bakelite medium shock resisting material by Litholite for Wingrove and Rogers Ltd. (Left and centre) The black Bakelite dashboard mask is moulded by Litholite for AC-Delco.

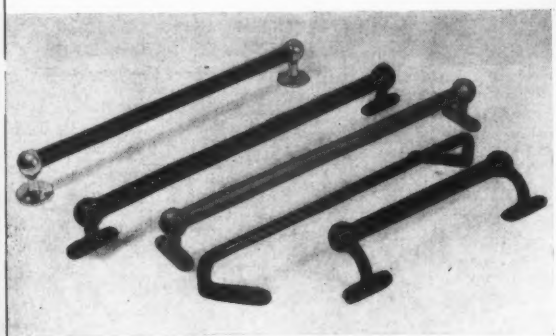
(Right) Mouldings on the Douglas Vespa motor scooter include handlebar switch assembly (incorporating light switch, ignition cut-out and horn button) H.T. terminal, washer and L.T. terminal.



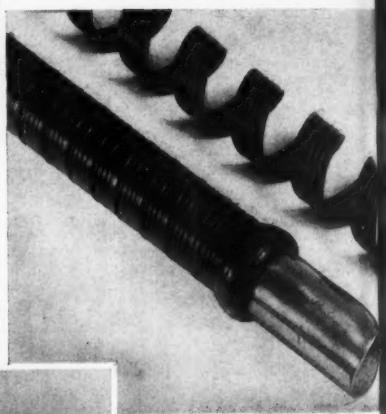


(Left) Four-spoked commercial vehicle steering wheel covered with Doverite cellulose acetate.

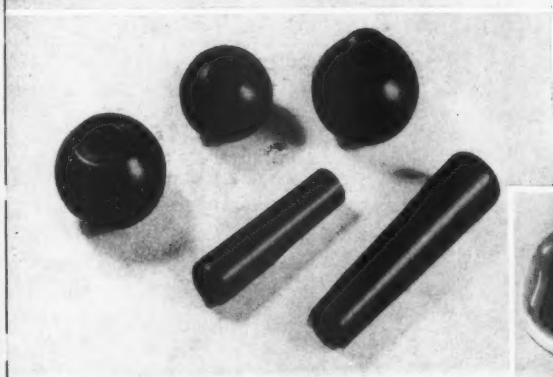
(Below) Steel omnibus rails are covered by Dover Ltd., with Doverite cellulose acetate, giving hard wearing, easily cleaned and colourful surface.



(Below) Extruded spiral acetate strip can be wound around bus hand rails and similar parts to give a permanent colourful grip which is hygienic and clean to handle. The strip can be fitted to existing rails; it is made by Dover Ltd.

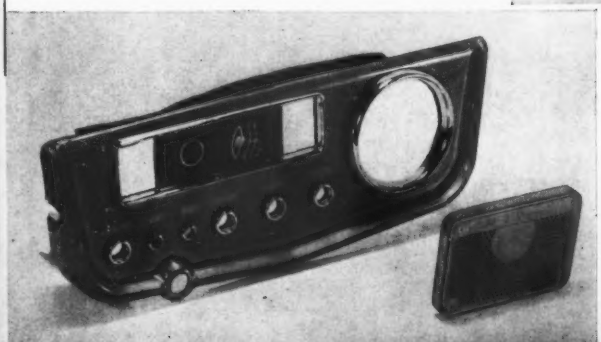


(Below) The Doverite plastic covering is also used for strap hangers and grab handles.

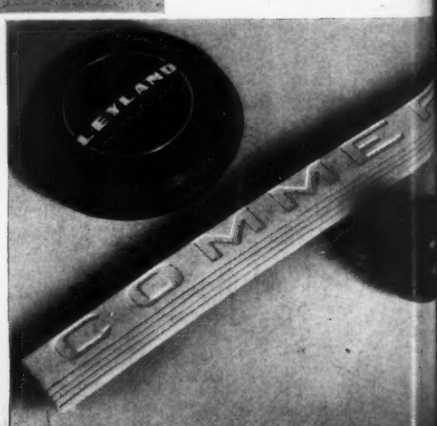


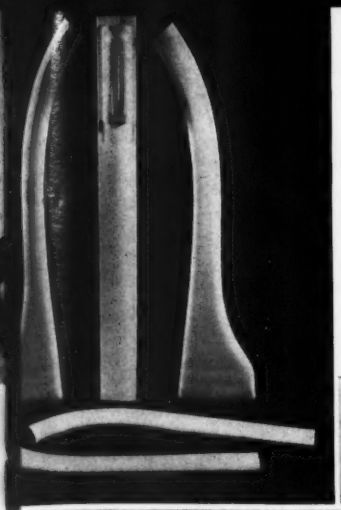
(Above) Plastic knobs and handles are made by Dover Ltd., to standard and specific sizes, for use on gear levers and controls.

(Below) Three-dimensional st ing wheel badge for Leyla injection moulded cellu acetate nameplate for Comm and phenolic gear lever knob among the components made Wilmot Breeden Ltd. for var commercial vehicle manufactur

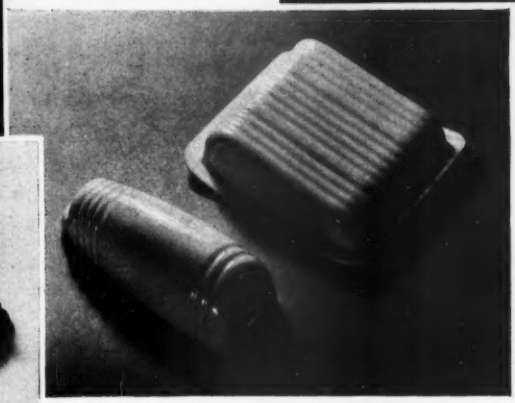


(Left) Instrument panel moulded from Perspex acrylic sheet, is fitted to 10 cwt. Commer vans; stop and tail light reflectors moulded in red transparent acrylic material for Autowire and Maintenance Co. Ltd.—both parts are made by Clearex Products Ltd.





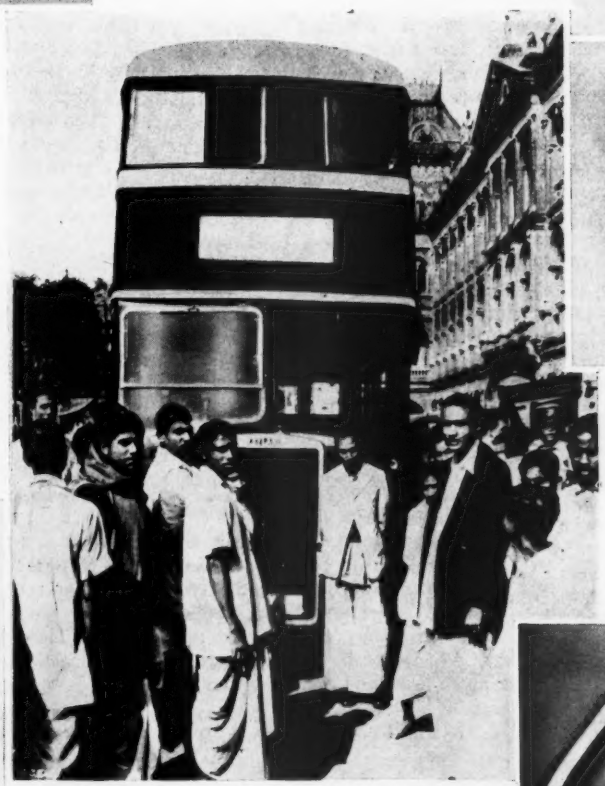
(Left) Interior lighting fittings for coaches by Mulliners, Ltd., fabricated from opal Perspex by P.D.I. Ltd. ; (below) Perspex cover for interior coach light made by P.D.I. Ltd., for Wilmot Breeden Ltd., from cream Perspex.



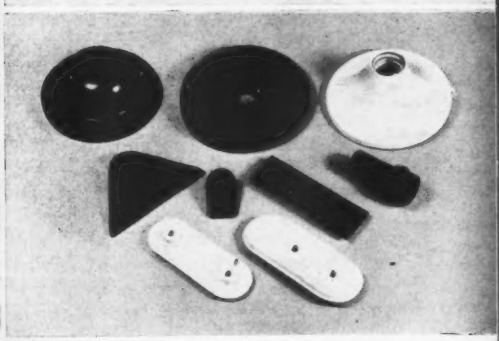
(Above) Van for demonstrating Formica laminates made by Thos. De La Rue and Co. Ltd., also employs Formica in its construction.

(Below) Gear lever knobs and other phenolic components are moulded by Fredk. W. Evans Ltd.

(Left) Ignition and light switch assembly incorporating several Bakelite phenolic mouldings, made by Wilmot Breeden Ltd. ; the moulded parts are also shown separately.

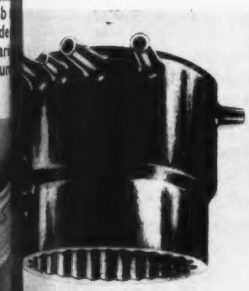


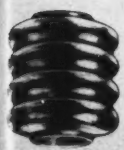
(Below) Waterproof magneto cover made by Hellermann Ltd., by p.v.c. dip-moulding; internal flutings permit circulation of cooling air, "spouts" grip the H.T. cables under tension ensuring waterproof seal. The smaller p.v.c. component protects striking shafts or gear lever joints.



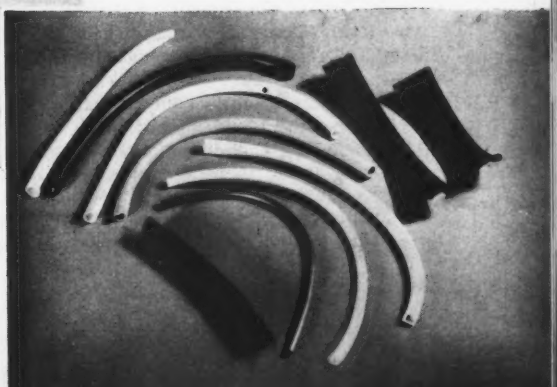
(Above) Light fittings and other components moulded by Fredk. W. Evans Ltd.

(Below) Selection of extruded plastics tubing, piping and sections made by Tenaplas (Sales) Ltd., for commercial vehicle manufacturers.





(Above) Perspex acrylic windows have been fitted at front and rear of this Leyland double decker bus, for the safety of passengers. (Photo : I.C.I.)



LETTERS TO THE EDITOR

Correspondents are reminded that a stamped and addressed envelope should be enclosed in all cases where a personal answer is desired. It is understood that any letter received may be published at the discretion of the Editor.

Plastics Sleevings

SIR,—With reference to a letter published in the June issue of *Plastics*, with the above heading, in order to remove any possible misunderstanding in the trade we wish to make it clear that the mark Vietum is a registered trade mark owned by this company and that the process by which we make our Vietum sleeving is the subject of a number of Patent Applications in both Great Britain and in foreign countries.

LACRINOID PRODUCTS, LTD.
Gidea Park,
Essex.

Butadiene Copolymers

SIR,—The recent announcement by Imperial Chemical Industries Ltd., regarding its intended activities in the field of butadiene copolymers, has in some quarters given rise to the misunderstanding that the company intend to enter the shoe-soling or footwear business.

We should like to make it clear that this is not so. It is intended only to manufacture a range of copolymers in the form of aqueous dispersions, resins and rubbers for sale as raw materials to existing industries.

IMPERIAL CHEMICAL INDUSTRIES, LTD.
Imperial Chemical House,
Millbank, London, S.W.1.

Plastic Seals

SIR,—We have been asked whether it is possible to purchase seals manufactured from "malleable plastic" and whilst we, ourselves, feel that this material is not marketed in a malleable state, we should be grateful to receive your advice on this point. At present, we use a standard lead seal (similar to those used by the G.P.O.) which is closed with sealing pliers after a wire has been inserted through a centre hole.

ESSO PETROLEUM CO., LTD.
Thames House North,
Millbank, London, S.W.1.

[EDITOR'S NOTE: There was in fact a "malleable" phenolic-type plastic made before the war by, we believe, British Resin Products, Ltd., who had made some excellent seals from it.]

Polythene Cigarette Box

SIR,—I wish to refer to the letter which you published in the January issue of *Plastics* from a cigarette company which wished to obtain boxes for the American style cigarette packs. I have now forwarded samples of one of my manufactures, in polythene, to Rothmans, Ltd., 13 Underwood Street, London, N.1.

V. D. ANTIKIDES.
Dutch and Oriental Trading,
Molenstraat, 2, The Hague,
Holland.

Plastic Bearing Materials

SIR,—We would like to learn something about the capabilities of various plastic materials for application to the bearings of shafting running at rather high speed and lubricated by oil or water. In particular, can you supply the name of the manufacturer of a product known by the name of "Fluon."

HEENAN AND FROUDE, LTD.
Worcester.

[EDITOR'S NOTE: Laminated phenolic bearings are made by several companies, including Ashdowns, Ltd., Knowsley Road, St. Helens, Lancs, The Bushing Co., Ltd., South Drive, Hebburn-on-Tyne, Co. Durham, Ioco, Ltd., Netherton Works, Anniesland, Glasgow, W.3, and Tufnol, Ltd., Wellhead Lane, Perry Barr, Birmingham, 22B. Nylon bearings are made by Plastic Engineers, Ltd., Treforest, Glam., and Punfield and Barstow (Mouldings), Ltd., London, N.W.9. "Fluon" is the trade name of polytetrafluoroethylene, manufactured by Imperial Chemical Industries, Ltd., Welwyn Garden City, Herts.]

P.V.C. Repair Service

SIR,—We refer to your note, "Mending P.V.C. Sheet," which appeared on page 92 of the March, 1954, issue of *Plastics*, and would advise you that we are at present operating a repair service for all types of p.v.c. protective clothing, including gloves, overalls, coats, leggings, tarpaulins, etc., both supported and unsupported.

The method of repair is essentially one of welding, which we have developed. and the repaired articles have similar characteristics to the original, i.e., chemical resistance, tensile strength. Furthermore, it has been said that this repair service increases the working life of p.v.c. gloves at least fourfold. We undertake sample repairs free of charge to illustrate the nature of the repair.

G. MCCORMICK AND CO.
29 Blackfriars Street,
Manchester, 3.

Acetate Magnetic Tapes

SIR,—We were interested to see in the article by C. P. Fagan on the manufacture of magnetic tapes, *Plastics*, September, 1953, that there are ample supplies of suitable tri-acetate available in this country. We are particularly anxious to get in touch with any manufacturers of this material.

M.S.S. RECORDING CO., LTD.
Poyle Close,
Colnbrook, Bucks.

Plastic Drinking Tubes

SIR,—We shall be very grateful if you can give us the name of a manufacturer of plastic drinking tubes, as a substitute for ordinary drinking straws. Alternatively, can you give us the name of a manufacturer of Perspex or p.v.c. small tubes which might be used for the same purpose.

D. F. TAYLER AND CO., LTD.
New Hall Works,
George Street Parade,
Birmingham, 3.

Suitcase Handles

SIR,—We are requiring plastic attache and suitcase handles, and are wondering if you can supply the names of manufacturers or stockists. The handles must be complete with metal fittings to allow for a side drop, i.e., the rivet holes must be in line with the handle, and not at right angles to it.

REDLANDS MANUFACTURING CO. (HAMPTON), LTD.
Maze St., Barton Hill,
Bristol, 5.

Large Fabrications

SIR,—We shall be pleased if you will put us in touch with manufacturers of semi-circular radar windows. The approximate dimensions will be 3 ft. 3 in. radius by 7 ft. long, preferably in transparent material, and as an alternative we might accept some multi-sided geometrically formed.

THE GENERAL ELECTRIC CO., LTD.
Radio and Television Works,
Spon Street,
Coventry.

[EDITOR'S NOTE: Amongst the companies capable of handling large jobs of this type are Thermoplastics, Ltd., Luton Road Works, Dunstable, Beds, and The Triplex Safety Glass Co., Ltd., 1 Albemarle Street, London, W.1.]

Plastic Milk Bottles

SIR,—We are anxious to obtain supplies of transparent plastic 1-pint milk bottles which would have a similar appearance to glass.

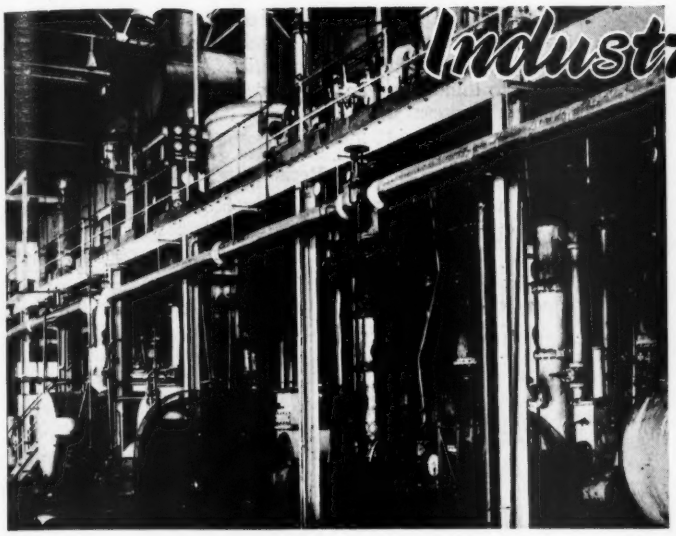
We feel sure there would be a good trade for this class of bottle if some firm would undertake the manufacture. We would be in a position to make the necessary moulds and supply glass bottles to show our requirements.

T. G. MARTIN AND CO.
Old Colony House,
Ridgefield, Manchester, 2.

Kel-F

SIR,—We should be pleased if you could advise us who are the suppliers in this country of Kel-F, in bar or moulded form.

NORMALAIR, LTD,
Yeovil,
Somerset.



Industrial Profile

1895 saw the formation of the British Cyanides Co., Ltd. From this company has grown British Industrial Plastics, Ltd., a large and complex organization carrying out the manufacture of resins and moulding powders, the construction of presses and ancillary equipment, the production of moulds, and the moulding of thermosetting and thermoplastic materials. How it began, and how it has developed during the past sixty years, is recorded in the following article.

FROM low-grade ores to high-grade plastics seems a far cry, yet the beginnings of one of the leading plastics firms—British Industrial Plastics Ltd.—were bound up with the production of cyanide for the extraction of gold from low-grade ores. Chance and Hunt Ltd., and Albright and Wilson Ltd., both with factories at Oldbury, Birmingham, joined forces and formed a small subsidiary, The British Cyanides Co. Ltd., the function of which was to produce sulphocyanide from carbon bisulphide and ammonia and then to convert it into cyanide. Direct conversion was a difficult problem but the solution was by prussiate as an intermediate product. The Boer War caused the temporary disappearance of the largest market for cyanide and the factory was temporarily closed.

It was not until the election of Kenneth Chance to the board of the company, in 1901, that its fortunes were reshaped, with the result that by 1904 it was operating a new process for recovering cyanogen from coal gas.

The rise and fall in the tide of fortunes of the company marked its progress until the early '20s. The British Potash Co., formed jointly by The British Cyanides Co. and the Ministry of Munitions could, if adequately supported, have established a permanent potash industry in Great Britain. Lack of Government support, however, forced the company into liquidation, its capital lost and its plant sold for scrap.

Two of the men who lead the Group today, Charles Glassey and Cyril Dingley, remember vividly the changing fortunes of the early days of the organization. Charles Glassey toured the wilds of Brazil in a fruitless search for potash deposits. Kenneth Chance brought back from America the idea of converting sulphocyanide into thiourea for use in vulcanizing rubber and weighting silk. Because of the small demand for the material in Britain, Cyril Dingley toured the silk-dyeing districts of Europe and arranged contracts, but after two years weighted silks were going out of fashion.

First Urea Moulding Powder

However, at the Wembley Exhibition of 1925 a product of thiourea and formaldehyde was shown by British Cyanides as a moulding powder, with projected applications ranging from electrical accessories to domestic picnic ware. From this small beginning it was decided to concentrate on the commercial production of white moulding powder, which first saw the light of day in 1926, the first in the world.

The development of the new moulding powder was not without considerable difficulties. A severe financial crisis, coupled with the technical difficulties involved in moulding, led Kenneth Chance to induce two personal friends to put up money for the formation of the Beetle Products Co. Ltd., which was to purchase the resin which was being made at Oldbury and to manufacture from it Beetle moulding powders and synthetic resins.

Still handicapped by acute shortage of finance, a display was organized at Harrods in 1926 of moulded tableware. The following year demonstrations were given at other well-known London stores, and the success with which these products met enabled the repayment of the two original shareholders in Beetle Products and the taking over of that company as a wholly-owned subsidiary of the British Cyanides Co. Ltd. This latter name the company held until 1936, when it was changed to British Industrial Plastics Ltd.

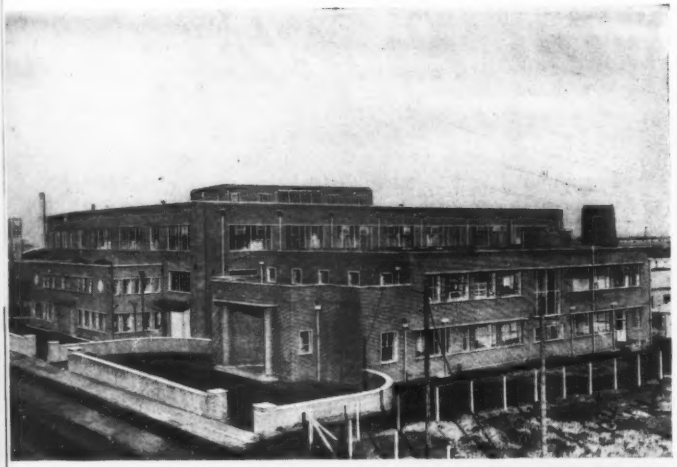
The Streetly Manufacturing Co. Ltd. had already been purchased in 1929, and it was in 1936 that the toolmaking shop of the Streetly Manufacturing Co. Ltd. was moved to separate premises at Tyburn Road, Erdington, and became a separate company, B.I.P. Tools Ltd.

This brief account of the company's historv touches upon only a few of the highlights which have coloured its progress, but the fund of experience which has been built up from these periods of changing fortune, ill luck and shortage of money prevails today in the management of a highly efficient Group. The lessons of those early and difficult days have not been forgotten, with the result that the Group, given the stimulus of the war, has gained a secure and leading place in the British plastics industry.

From the early stages as a technical manufacturing company, the organization has undergone radical changes. Today it is possible to see in the Group four separate and four distinct fields of operation, namely, plastics raw materials manufacture, at Oldbury, moulding at Streetly, machine construction by B.I.P. Engineering Ltd., also at Streetly, and toolmaking at Tyburn Road, Birmingham.

Fulfilling as it does these four functions, it may well be wondered how such an organization can exist on terms of goodwill with the plastics industry as a whole. Others have tried without success to build up the kind of self-contained organization which exists within the B.I.P. Group, at the same time continuing the sales of, for example, moulding powders. For the answer to this question one must look more closely at the extensive organization centred upon Birmingham, which, despite its multifarious interests, maintains the atmosphere of a co-ordinated unit.

Resin manufacture at Oldbury is still carried out in two main factories, excellently served by road, rail and canal. Here for many years has been manufactured the urea-type



resin, finding application not only in moulding powders, but also in very large quantities as wood adhesives, coating resins, in textiles, paper and other applications. Indeed, it would be difficult to think of an industry today that does not make use of resins produced at Oldbury, and the original productions have been expanded to include melamine resins and alkyds.

New Resin Plant

Now a third factory has recently been completed for the manufacture of Beetle moulding powders which embodies all the experience of the past under modern conditions of plant layout and process control.

As one walks through the production departments one sees the large reaction vessels from which the resultant resin is passed through spray-dryers to give a powder of sub-micron particle size. The liquid resin is metred into Baker-Perkins mixers, which are then charged with fillers, pigments and plasticizers; the mix is then passed down to turbo-dryers, pre-ground, ball-milled, densified and ground again, blended and transferred to the finished goods stores with subsequent dispatch to the customer.

The visitor will be more than impressed by the cleanliness rigorously enforced in each stage of moulding-powder manufacture. Every part of the plant is accessible to a complicated vacuum-cleaning system, since only by such stringent precautions can an ultra-pure, flawless moulding powder be manufactured.

Here, then, in the heart of Oldbury, is the core of the organization. With links in practically every field of manufacture, its products range from the pastel-shade urea powders from which picnic ware and telephones are moulded through to the adhesive resin widely used in plywood, furniture manufacture and aircraft construction.

The progress of production at Oldbury is constantly under review. Urea and melamine moulding powders are probably amongst the most difficult plastics materials to manufacture, demanding as they do critical control at every stage. The densification process, for example, which turns minute powder particles into the granules which can be adequately handled in the moulding process, is typical of the fine control

No. 3 FACTORY AT OLDBURY

(Top left) View of research laboratories and the new No. 3 factory.

(Centre left) Urea formaldehyde resin department. Here the liquid resin is mixed with the filler.

(Bottom left) A section of the mixing department.

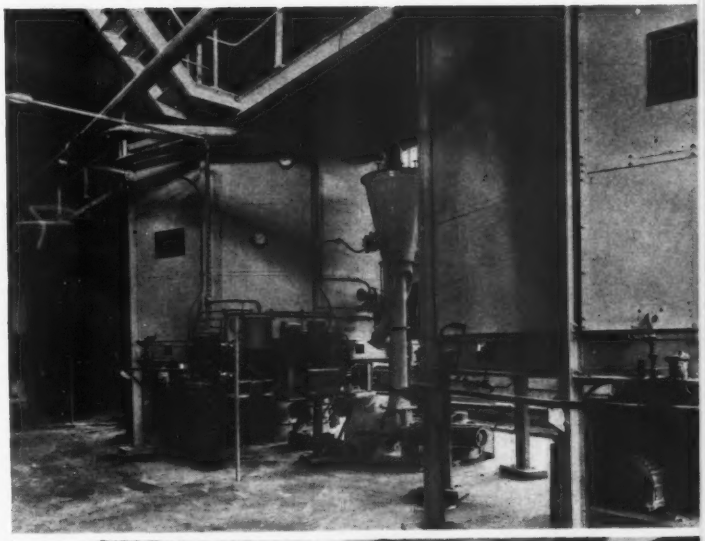
demanded. Here, as elsewhere in the factory, the latest kind of electronic control equipment is at work, standardizing products and providing the teams of technologists with accurate records of day-to-day production.

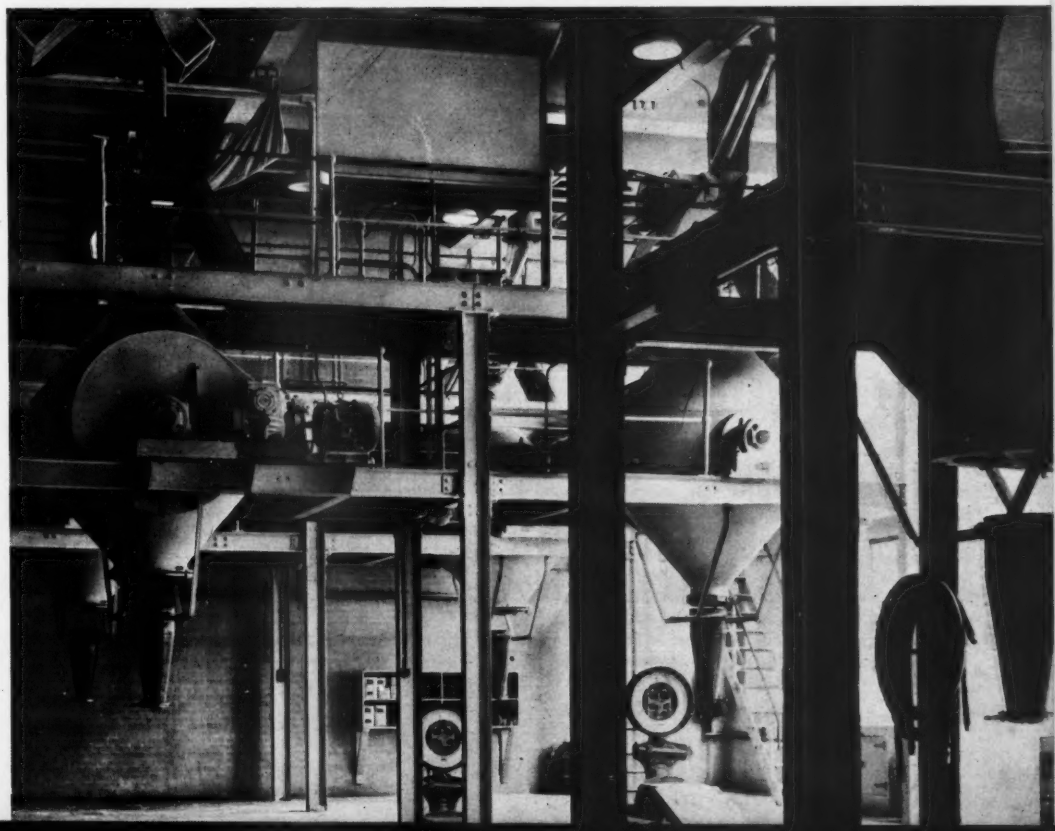
Research and Technical Service

A separate building houses Oldbury's research laboratories and technical service departments. Apart from control laboratories which watch the progress of resin manufacture 24 hours of the day, the research block houses a team of scientists whose main functions are twofold. First, they study the properties of Oldbury's standard products and modify and improve them. Secondly, the technical service department handles the multitude of problems which confront customers and potential customers. Investigating the problems of industries as diverse as textiles and paints, they offer new formulations, process modifications and a wealth of other information which places the Group as a whole in the forefront of modern manufacturing plants. At the recent British Plastics Federation luncheon, Mr. Heathcoat-Amory complimented the plastics industry on the £5 million which is expended each year on research. With this tribute must be coupled the name of B.I.P., since this company contributes largely to research expenditure in modern industrial development.

Moulding

Over now to Streetly where one of the most modern moulding plants in the country fabricates items as diverse as scale pans and electrical fittings. This, however, is a moulding shop with a difference since its doors are always open to any customer of the B.I.P. Group. Whether your interest lies in moulding powders, tools, machines or moulding you are able to study at first hand the developments and techniques which are employed in the Streetly works. Here the preaching of Oldbury is practised and in turn provides Oldbury itself with a unique opportunity of checking and rechecking on a practical scale results of its progress in powder manufacture. The relatively crude urea moulding powders of 1926 have been





No. 3 FACTORY AT OLDBURY

(Top, right) Here the moulding powder is dried prior to ball-milling.

(Centre, right) Ball-milling department.

(Bottom, right) Here various batches of mou'd-ing powder are blended together prior to dispatch.

transformed into the precision materials of today, and in large part Streetly has supplied a proving ground for Oldbury's products.

Machinery Manufacture and Tools

Recent years have seen the introduction of Bipel machinery and its successful entry into the industry has been very largely due to the experience acquired over the years by all sections of the Group. Well aware of the special precautions called for in the moulding of modern plastics materials, B.I.P. Engineering, Ltd., designed radically new types of machines. To them must go the credit for the self-contained press and the streamlined and efficient central pumping system to supply hydraulic fluid to a variety of presses. So far as Bipel equipment is concerned, steam-heated platens and steam lines have been dispensed with, and in their place are compact presses, heated by electricity and equipped with the latest control instruments. Only by the use of modern plant of this kind is it possible to secure lengthy runs at economic production rates. At Tyburn Road the engineering ability of Streetly is matched by the manufacture of high-grade tools which are used in this country and all over the world. The factory now in the course of expansion manufactures moulds with the aid of the latest toolroom equipment and it is generally recognized that B.I.P. stand in the forefront of the mould makers craft. Again, the experience of Streetly and Oldbury is available to the staff at Tyburn Road, and many of the lessons hardly won by the other branches of the organization are put to good use.

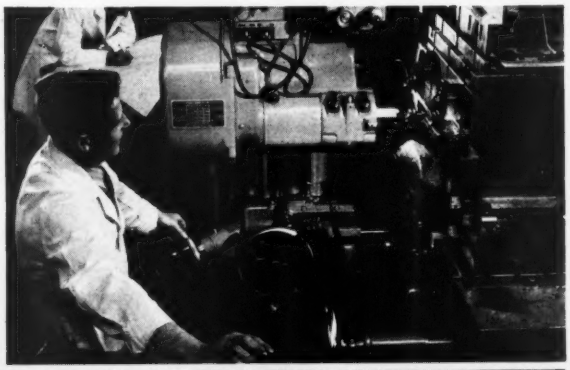
At the centre of this complex and highly diverse organization sits Charles Glassey, who, with his knowledge of the past, controls one of the most complex units of the British plastics industry. To him, the organization which is growing so rapidly is still in its infancy. His mind is not so much concerned with the doings of today, which are the result of planning and forethought years ago, as with the future developments of the plastics industry and of industry as a whole and with their repercussions upon his Group. One of his special cares is the engineering school at Oldbury, which is designed to instruct suitable trainees both from inside and outside the organization and which is administered by James Butler. These students are today drawing upon the experience of the older personnel within the B.I.P. Group; trained amongst up-to-date plant that will supply the executive leadership of the B.I.P. of tomorrow.

Another project is the product design and development service, a member of which, has for three years running, won the award of the Horner's Company. This department supplies a valued service to the plastics industry by considering projected mouldings and bringing to bear on them a design service which has the backing of the complete B.I.P. Group.

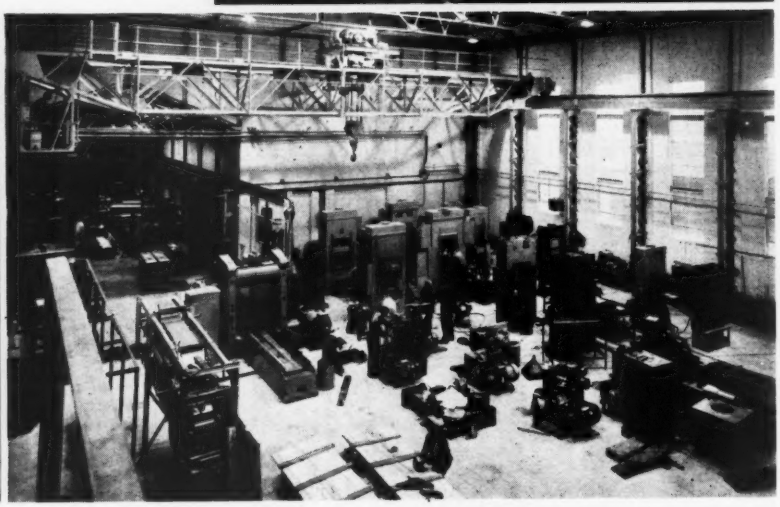
Today, the company is actively developing its interest in the polyester field. Members of the staff are travelling the world to study progress and to compare notes with developments in Britain. The company, already manufacturing a limited range of polyester resins has plans in hand for a major increase in production. Polyester resins may well be a big thing of the future; when they are, Charles Glassey is confident that his team of technical colleagues will be well in the forefront of this important development.

(Left) Research. Here a chemist is working on resins for paper treatment.

(Right) Milling a dashboard grille surround on a Keller automatic die-sinking machine at B.I.P. Tools, Ltd.



Compression moulding shop at Streetly Manufacturing Co., Ltd.



Press assembly shop, showing new extension to the works of B.I.P. Engineering, Ltd., at Streetly.

HANOVER 1954 GERMAN Industries Fair

(Above) Two views of the "Chemistry and Plastics" Hall at the Hanover Fair.

The Hanover Fair now combines in one event the technical and commercial Fairs previously held separately, and draws both exhibitors and visitors from all parts of the world. Germany's manufacturers of plastics machinery and materials were well represented. The only British exhibitor in this field—who showed injection moulding machines—reported excellent business.

THE growing development of the German plastics industry and in particular that branch concerned with producing raw materials has aroused much interest throughout the world in recent years. Before 1939 Germany, led by the huge I.G. Farben Group, dominated many branches of plastics development and many techniques which are now commonplace — such as injection moulding, heat-welding and other thermoplastics fabrication processes. Much of this lead was destroyed during and after the war at a time when Britain and U.S.A. were rapidly developing their plastics material output and whilst Britain became a major exporting country in the world.

The remarkably rapid recovery of West Germany's industry is nowhere more evident than in the field of plastics where all the old materials as well as many new ones, which until recently were laboratory curiosities, are now being offered on the world market at competitive prices.

Comparing developments in Britain and Germany there are still many fields such as polythene, polyesters, silicones and even polystyrenes with their newer variations, in which Germany is only at the development stage where Britain is in commercial scale production. In reviewing the Hanover Fair, therefore, we have selected for particular mention products which are comparatively new to Britain.

Plastics Raw Materials

To show the products of the plastics and chemical industry a large hall in the exhibition grounds has been renovated and enlarged so that this year 70 companies, more than ever before, showed their products.

Anorgana G.m.b.H. of Gendorf, showed a variety of p.v.c. materials, including embossed sheeting and leathercloth, unplasticized sheeting for packaging, stretched unplasticized material for use in recording tapes and two materials suitable for weaving basket work—Peddigen which is an extruded strip used for making baby's cots and perambulators and Genotherm, thin strips of unplasticized p.v.c. similar in shape and texture to raffia and used in chair coverings, screens, etc.

A new production at the exhibition was a special packaging film type GUV, made with a non-migrating plasticizer, which has high tensile strength with insulating properties and resistance to water vapour, acid and alkalies. It is suitable for use at temperatures between −40 and +140° F. The other new material is a hard unplasticized sheet suitable for gramophone records.

Anorgana also makes a variety of inorganic and organic intermediate products including plasticizers for p.v.c. They are represented in this country by Revai and Co., Ltd., 7-8 Idle Lane, Eastcheap, London, E.C.3.

The one-man canoe made from glass cloth bonded with Bayer's polyester resin is one of the largest reinforced plastics mouldings yet built in Germany.

Badische Anilin and Soda Fabrik A.G., Ludwigshafen, a. Rhine produces probably a greater variety of synthetic resins and plastics materials than any other company in Germany. These include polythene, now coming into full-scale production, polystyrene—and for the first time a grade EB with increased toughness is now available—Styropor, a polystyrene foam material which after a short development phase is now being accepted for a variety of uses. Styropor can be supplied in granule form and may be foamed *in situ* to give different shaped light-weight articles for such applications as lifebelts, buoys, fishing net floats; in the display field for clothing display forms and special window dressing effects; in building as thermal and scientific insulation; in packaging as a shock resistant container and for toys and games.

In the field of polyester resins where B.A.S.F. have produced materials suitable for low-pressure lamination with glass fibre reinforcement there is now a new, more flexible grade which may be used alone or blended with the harder grades to produce tougher and more elastic laminates.

Ultramid are polyamides similar to nylon and perlon and suitable for moulding and machining. A new type, Ultramid S has considerably lower water absorption than other nylon-type materials and in consequence is likely to have greater use in the electrical industry.

Some success has been obtained in the processing of Luvican M170, a polyvinyl carbazole, which in its unoriented form is a transparent glass-clear material softening at about 200° C. Its value lies in the fact that it is completely resistant to boiling water and can be used at operating temperatures up to 150° C., also under conditions of chemical attack from acids, alkalies and even solvents such as carbon tetrachloride. One of the problems has been to produce a grade of material which will not degenerate at the high injection moulding temperatures of 300° to 400° C. but B.A.S.F. claim that Luvican M170 withstands these conditions without any deterioration.

In addition B.A.S.F. produce p.v.c. resins and sheets, tubes and foils of unplasticized

material, polyisobutylene and a range of vinyl and acrylic dispersions and solutions for use in many industries.

These dispersions are grouped under four names, Acronal representing acrylic esters, Lutofan based on vinyl chloride, Styrofan based on styrene and Oppanol containing isobutylene, these polymers in each case being the principal constituents of the dispersional solution.

In the field of urea and phenolic resins particular attention has been paid to resins for bonding wood waste materials and on the stand articles such as typewriter covers, radio cabinets and similar large mouldings were shown.

The German C.I.B.A. company, an offshoot of the Swiss company, showed only their plastic products—ethoxyline resins, melamine formaldehyde resins, and urea formaldehyde resins. The first-named are substantially similar to the Araldite resins supplied by Aero Research, Ltd., in Britain. Exhibits on the stand showed their uses as laminating materials, casting and embedding resins and as metal adhesives. A number of melamine mouldings were shown, amongst these being a set of tableware decorated by pressing a printed cellulose foil into the surface of the moulding. Although decorated mouldings of this type have been made in Britain and illustrated in *Plastics*, the excellent way in which the decorative foil retains the shape of the finished moulding, e.g. a cup, is noteworthy.

Deutsche Fibrit-Gesellschaft, Krefeld, demonstrated a number of moulded reinforced fibre containers which had been coated on the inside and outside with a p.v.c. lacquer, making them resistant to chemical attack. Being unbreakable and shock resisting, such hardboard bottles and containers have been found very useful in the transportation of chemicals.

Farbenfabriken Bayer, Leverkusen. The exhibit of most interest on this company's stand was a one-man canoe made of glass fibre cloth bonded with Bayer's Leguval polyester resins. This boat together with another body shown on the stand of B.A.S.F., were the largest reinforced plastic products at the Fair—the B.A.S.F. boat being made from German resins by a British manufacturer. Bayer are now also developing a range of Silopren silicone products principally in the form of elastomers.

Two types of injection moulding materials are offered by Bayer. Durethan BK, a polyamide based on caprolactam is available in three grades of hardness in black, white and ivory. A hard grade containing 15% graphite is also produced. The material has been found useful for the fabrication of films, sheets and rods as well as injection moulded components. Durethan U is a polyurethane which can be fabricated in a similar way to grade BK but has considerably higher temperature resistance and lower affinity for moisture, making it valuable in electrical applications.

Decorated tableware moulded from melamine material, shown by CIBA. Permanent coloured designs are obtained by incorporating printed cellulose foil in the moulding.

Perhaps of greatest interest are the range of materials based on Desmodur (di- and tri-isocyanates) and Desmophen polyesters. The isocyanates are characterised by high reactivity with chemical compounds containing hydroxyl groups and the Desmophen polyesters (in the form of soft resins) are combined with them to form a variety of interesting products. As cold setting lacquers they produce extremely tough, flexible and hard films with good adhesion to all types of surfaces. For example valuable floor coating lacquers have been developed giving many times the life of other finishes. In addition to the cold setting lacquer, formulations for stoving are also available.

By combining the Desmodur and Desmophen materials in the presence of foaming agents lightweight porous materials both flexible and rigid can be obtained. The resultant foamed plastic materials are known as Moltopren. This process has already found many commercial applications in the manufacture of sponges, insulating materials and structural fillers, e.g. aircraft. Foams are normally prepared in flat sheet form but techniques for foaming into a mould to produce different shaped articles are now being developed.

Moltopren sponges can be joined to p.v.c. sheeting by h.f. welding and one exhibitor using the material has made beach toys and toilet articles from this combination. Bayer hold the patent rights for the foaming techniques as well as for the materials and fabricators already under licence. A large company of sponge manufacturers in England, Kay Brothers, Stockport, Cheshire, are already producing Moltopren and other British manufacturers are investigating the material. It is thought by the manufacturers that when fully developed Moltopren will provide serious competition to the foamed rubber latex field.

Vulkollan is a new type of elastomer which has been found to have remarkable abrasion resistant properties as well as good chemical resistance. Techniques for fabricating it are similar to those employed in rubber manufacture. Experimental parts which have been produced include shoe soles having many times the life of a rubber sole, chemical apparatus and even racing tyres. The high cost of Vulkollan is likely to retard its rapid development, except in specialized applications.

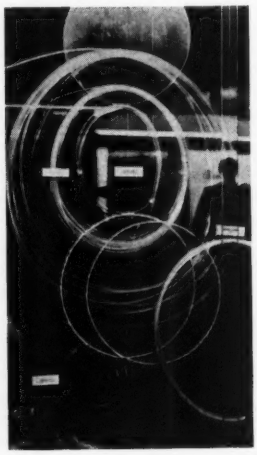
Dynamit A.G., Troisdorf, showed a wide range of moulding powders and semi-finished products of both thermosetting and thermoplastic materials. These include phenolic, urea, cellulose acetate, polyamides and p.v.c. moulding powders, industrial and decorative laminates, thermoplastic sheets, based on rigid and plasticized rigid p.v.c., celluloid, acetate and vinyl copolymers.

T. H. Goldschmidt A.G., Essen, have joined the ranks of German manufacturers developing a range of silicone products. At the moment these include oils, resins, anti-foaming agents and mould release agents.

Dr. Kurt Herberts and Co., Wuppertal, produce a range of p.v.c. plasticizers. Of great interest is Synestrol CM24, a fast-gelling material which can be used at a relatively low processing temperature with polymers having a high K value. The plasticizer is resistant to boiling water and dilute cold acids and alkalis. Products made with the material have excellent low temperature properties.

Farbwerke Hoechst A.G., Frankfurt, showed Hostaflon—a transparent polymer of trichlorofluoroethylene. This material has outstanding heat resistance for a thermoplastic and it is resistant to nearly all forms of chemical attack. Unlike polytetrafluorethylene it can be processed by normal production methods such as extrusion, injection-moulding, compression moulding, providing the materials of construction of the machines and tools are able to withstand processing temperatures around 300° C. and are corrosion resistant to acid fumes which may be given off. Excellent results have been obtained in extruding tubing for conveying hot chemicals and cable coverings.

In addition, Farbwerks Hoechst produce a range of vinyl and acrylic dispersions and emulsions used mainly in the coating field and in adhesives.

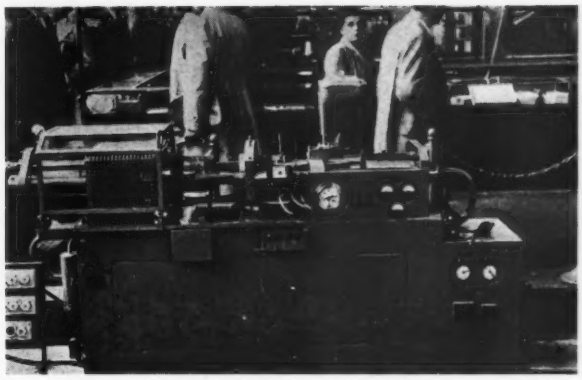


Examples of extrusions and moulding in Hostaflon.

Kalle and Company, A.G., Wiesbaden, specialize in the production of thin foil materials. These range from cellulose film, cellulose acetate and polythene to the newer materials, such as Supronyl and Suprotex. Supronyl and Suprotex are superpolyamide films based on caprolactam and intended for specialized packaging purposes where great strength and flexibility are required. On the Kalle stand an ultra-lightweight raincoat made up from Supronyl was shown. Suprotherm is an unplasticized p.v.c. foil also used in the packaging industry. It has, however, found some interesting applications in the manufacture of transparent folders for office use and in advertising. It can be h.f. welded and made up into containers.

Dr. F. Raschig G.m.b.H. of Ludwigshafen, showed a variety of synthetic resins and moulding materials. Dekorit F is a phenolic cast resin suitable for machining which, because of its excellent dimensional stability and chemical resistance, finds many uses in

Bussmann 30 grm. (0.7 oz.) automatic injection moulding machine (Hahn and Kolb).



Eckert and Ziegler EHS30 injection moulding machine with direct hydraulic drive.

the fabrication of technical components. A range of Resinol phenolic resins include grades for foundry uses including shell moulding and casting resins for the production of models, jigs, fixtures, etc., in the engineering industry. Bascodur is a material developed by B.A.S.F. and sold in the form of moulding powder by Raschig. It is a phenol-cresol resin principally employed in the production of chemical apparatus because of its excellent chemical and thermal properties. It is resistant to steam up to 150° C. and to a variety of boiling solvents.

Röhm and Haas G.m.b.H., Darmstadt, manufacturers of Plexiglas acrylic sheeting have now introduced a copolymer with extremely tough properties called Plexidur T. As a demonstration a U-shaped piece of Plexidur about $\frac{3}{8}$-in. thick was put between platens of a hand-operated press and bent until the U was completely flat. On releasing pressure the sheet regained its original shape without any cracks or crazing marks. This demonstration had been performed many times during the exhibition. In appearance Plexidur T is similar to Perspex and Plexiglas and its optical properties are only slightly inferior. Comparative figures between Plexidur and the standard grade of Plexiglas show

	Plexidur T	Plexiglas
Impact strength (cm.kg./cm.²)	45	20
Tensile strength (kg./cm.²)	900	750
Elongation at Break (%)	30	4
Modulus of elasticity (kg./cm.²)	45,000	30,000
Softening point Vicat (°C.)	85	105

H. Römmler G.m.b.H., Gross-Umstadt. The principal products of the company are laminates and a variety of both decorative and industrial grades similar to British products that were to be seen. However, neither the quality in the designs nor the developments in applications appeared to be up to the standards of equivalent British materials. Römmler also produce a variety of moulding powders including a urex resin type—mouldings such as telephone receivers were shown made from this material and Römmler claim that this is the first time that such difficult mouldings could be obtained from a u.f. powder without risking defects.

Schrupp and Co., G.m.b.H., Betzdorf-Sieg, produce sheet material for the electrical industry. These are based on Luvikan (vinyl carbazole), Iganil (aniline formaldehyde) and Sumdax, an acrylic-modified aniline formaldehyde resin. This latter is an improvement on aniline formaldehyde, having better thermal insulating properties, it has been employed widely in h.f. equipment.

This company also produces a range of equipment for the heat welding of thermoplastic sheeting. They are represented in Britain by Tanks and Linings, Ltd.

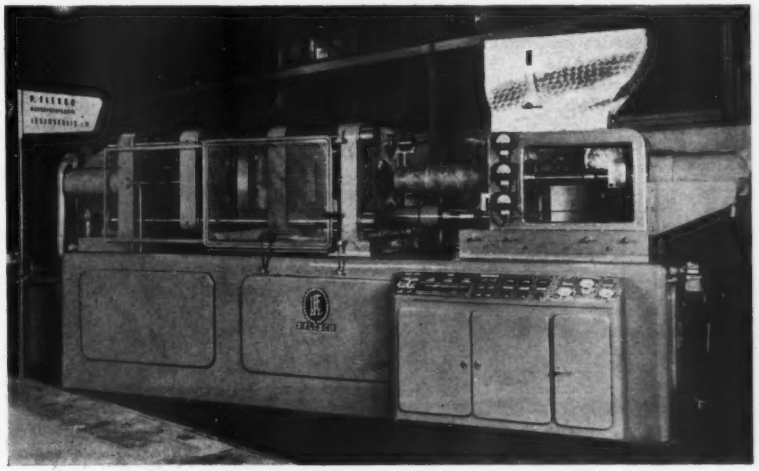
Wacker Chemie G.m.b.H., Munich, produce a range of plastics raw materials including p.v.c., vinyl chloride, acetate copolymers, polyvinyl alcohol and polyvinyl acetate and acetal. The latest addition to their production programme is a range of silicones.

Injection moulding machines

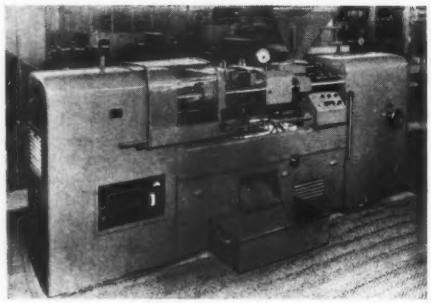
A great variety of injection moulding machines are manufactured in Germany and some ten makes of these were shown at Hanover. No definite trend of development is discernible since there is a great variety in the detailed operation of the machines, particularly as to hydraulic or mechanical operation.

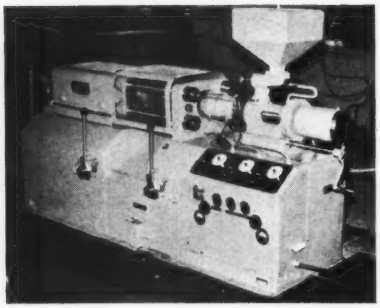
Ankerwerk of Nurnberg, produce a range of machines from 40 gram. to 600 gram. capacity. The latest addition to this range is type SE50/75 having a capacity of 75 cu. cm. (90 grams/$3\frac{1}{4}$ oz.) with a platen area of 470 by 310 mm. Like the other machines in the series the SE50/75 can be operated automatically, semi-automatically or by hand. Both injection and mould closing is hydraulic. A special feature of the machine is that the movable mould-bearing face runs on a gliding roller device which almost completely releases the tie bars from stresses and reduces wear and tear on the guide bushes. Locking and opening speeds can be adjusted independently to any desired limit. This mould-closing system enables the machine to be operated with only two tie bars.

Gebr. Battenfeld, Mainerzhagen, who are represented in Britain by Ed. Brand, Ltd., produce a range of fully mechanically operated injection moulding machines ranging from 0.7 to 36 oz. capacity. Battenfeld claim great advantages for the fully mechanical system both in operating costs and efficiency. Closing and injection units are each powered by a special electric brake motor operating through gears and safety slip clutches on a toggle lever system enabling the mould to be closed rapidly and by straightening the toggle lever the final injection pressure is applied. In the latest device the mould-closing force acts against a pneumatic cushion producing an evenness of pressure which can be measured and controlled on a pressure gauge. In addition to



Flesch 400/500 grm. injection moulding machine.





(Left) DS60VA fully automatic 1.4oz. injection moulding machine by Dr. Ing. Sommer.

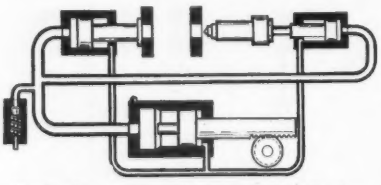
(Centre) H5OV injection moulding machine by Albert Stübbe.

the six horizontal machines produced, two vertical machines of 40 gram (1.4 oz.) and 100 gram (3.5 oz.) capacity respectively are also made.

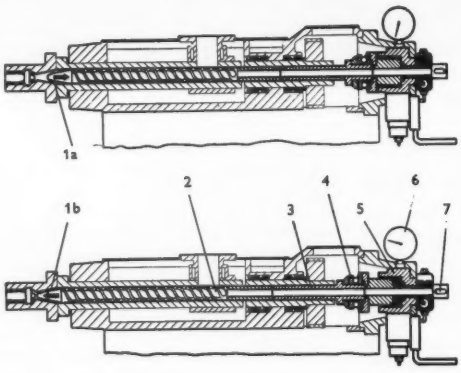
W. Bussmann KG, Munich (sole selling agents Hahn and Kolb, Stuttgart), showed for the first time their fully automatic GM10 injection moulding machine of 30-gram capacity. It is a fully hydraulic machine intended for high-speed production of small parts. Special attention has been paid to neatness of design, the operating parts being protected by a clear, acrylic guard. For foolproof operation by unskilled personnel the instruments controlling cycle time are kept in a sealed, locked box only accessible to the supervisor.

Eckert and Ziegler G.m.b.H., Weissenburg These manufacturers were the first to produce commercial scale injection moulding machines before the war and they are still currently in production with a range of both mechanical and hydraulic presses. Of great interest is the new EHS30, which employs an electro-hydraulic system operating without a pump. The drive operates from a motor through a gear acting upon a driving piston over a rack. The driving piston moves forwards and backwards acting upon the mould-closing system as well as on the injection plunger by means of the fluid medium. The system has the advantage that it is easy in operation and requires no valve control whatsoever. The driving piston works at two pressure stages, lower pressure stage of 213 p.s.i. operates the idle rotation of the mould platen whereas the high pressure up to 2,134 p.s.i. gives not only mould locking force but also the final injection pressure on the plunger. The driving motor can be cut out upon attainment of a predetermined pressure, pressure being maintained by a spring-loaded accumulator.

P. Flesch, Ludenscheid. Added to the range of machines made by this manufacturer is the type VHS4 shown at the exhibition, having a shot capacity of 400 to 500 grams. This is a fully hydraulic machine adjustable for automatic or manual operation. Special attention has been paid to easy accessibility of the platen faces for mould adjustment.



Hydraulic system of Eckert and Ziegler EHS30, injection moulding machine. Motor-driven ratchet drives piston actuating mould closing and injection, without pump or valves. Retraction of piston retracts mould and cylinder.



(Left) SP45 extruder by CMA: method of controlling extrusion pressure by varying gap between screw tip and die head.

1a. Screw retracted—free opening.
1b. Screw forward — restricted opening.
2. Screw.
3. Piston.
4. Pressure bearing.
5. Hydraulic mechanism.
6. Pressure indicator.
7. Screw forward indicator.

Dr. Ing Fritz Sommer, Ludenscheid, showed a new machine, the fully automatic model DS60VA.

Albert Stübbe showed a new model H50V which again can be operated automatically or by hand.

Tückmantel, Solingen. This company manufactures the range of Tumax injection moulding machines. There are three types, fully hydraulic, fully mechanical and a combined hydraulic/mechanical system. In the latter group are the Tumax Combi/170 of 90 to 100 gram capacity and the Tumax Combi/137 of 50 to 60 gram capacity. Closing pressure is mechanical with direct motor drive operated through an electromagnetic coupling. The injection pressure is hydraulic and operates through a built-in oil pump.

R. H. Windsor, Ltd., Chessington, Surrey, England, were the only British manufacturers (and in fact the only non-German company) exhibiting plastics machinery at Hanover. They showed two of their hydraulic injection moulding machines in automatic operation. Windsor produce machines ranging from a fast, fully automatic, 1 oz. capacity to the 32 oz. preplasticizing machine. Exhibits of mouldings made in Germany on Windsor machines included large refrigerator trays and a small travelling case in high impact polystyrene. The export manager of the company stated that they were very satisfied with the results of the exhibition and that despite difficulties German moulders are buying British machines.

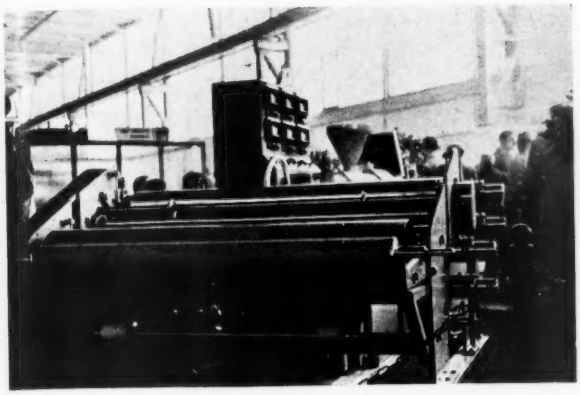
Extruders

C.M.A. (Chemie Maschinen and Anlagen G.m.b.H.), Frankfurt, showed an extruder claimed to be a great advance on existing machines. The improvement is said to lie in the control of pressure on the die head; a variable which in other machines can only be regulated by addition of strainer plates or by control of screw speed. By exercising this control of back pressure the manufacturers claim that the extruder can be operated adiabatically. The control is obtained by varying the gap between the conical head of the screw and a corresponding cone leading into the die head. This movement is obtained by a hydraulic piston acting on the pressure bearings at the rear of the screw. The pressure on this piston can be recorded and gives a valuable additional control to the operator. The machines are at present being built with 45 mm. (1¾ in.) and 60 mm. (2⅜ in.) screw diameters.

Hermann Berstorff Maschinenbau Anstalt G.m.b.H., Hanover. The 45-mm. extruder which has been added to the range of this company's products described in *Plastics*, December, 1953, is driven through P.I.V. infinitely variable gears from a built-in electric motor. It has an oil pump for gears, and a clutch enabling alteration of speeds whilst the screw is stationary. Five water-cooling zones are provided and five heating zones (usually arranged three in the barrel plus two in the head). The chrome-plated screw runs in a nitrided steel liner,

Johann Fischer, Lohmar, produce two extruders types JFP 32 and 50 (32 mm. and 50 mm. screw diameter), both being conventional single-screw types, driven by stepless valve P.I.V. gears. The machines are made on a solid cast base with completely built-in screw housing and special control cabinet. Provisions are made for water cooling.

Harburger Eisen and Bronzewerke A.G., Hamburg. This company has recently reached an agreement with National Rubber Machinery of U.S.A., to produce the NRM range of extruder equipment in Germany



Take-off equipment by Troester fitted to extruder (in background) for cooling, slitting and reeling polythene film extruded from a flat strip die, max. width 60 in.

and in consequence their independent production programme has now ceased.

Henrich Koch, Siegburg, introduced their new type HKS extruder at Hanover. This machine is built in three sizes, 40 mm., 80 mm. and 120 mm. Advantages are claimed for easy removal of the screw, infinitely variable speeds and accurate temperature control.

Reifenhauser. A new addition to this range of extruders was a machine with a special stainless steel screw and liner which has been developed for processing Hostaflon (polytrifluorochloroethylene). Great difficulties have been encountered in cable covering with this material due to the high extrusion temperature and the corrosive nature of decomposition products. Reifenhauser are represented in Britain by Ed. Brand, Ltd.

Paul Troester Maschinenfabrik, Hanover. The range of machines has already been described in *Plastics*, December, 1953. There were no new additions to the range but a special take-off equipment for polythene extruded from a strip die was shown. This includes cooling rollers and cutting equipment adjustable to 60-in. width. Troester are represented in Britain by Mr. James E. Gibson, 110 Park Road, Hampton, Middlesex.

High Frequency Apparatus

Hahn and Kolb supply a range of high frequency pre-heating ovens of 0.3, 1 and 2.5 kW. output, enabling 40, 140 and 350 grams of moulding powder to be heated to 120° C. in 30 seconds.

Himmelwerke AG, Tübingen, manufacture high frequency generators for a variety of purposes including the production of moulding powder pre-heating ovens (0.5, 1.1 and 4 kW. capacity). The company has also specialized in producing equipment for the continuous curing of synthetic resin adhesives in the wood working industry and of synthetic resin finishes for the textile industry. Our illustration shows the set-up of generator and electrodes for the continuous drying of synthetic resin treated textiles. The company is represented in Britain by Cecil Bentham Ltd., Stockport.

Körting Radio Werke, Grasse, produce a range of h.f. welding machines for fabrication of both rigid and flexible p.v.c. sheeting. Of particular interest is the development of a book-binding technique for which the company grants licences of the patent rights. This involves the welding of rigid p.v.c. backing sheets to a flexible outer cover which may be of a leather-like plastic material giving a durable and attractive binding. By high frequency embossing or combined embossing and foil transfer process, the appearance of such covers may be enhanced. Model Fixus G 2000 S has been found particularly suitable for this purpose. Special advantages claimed for Körting generators are stability of frequency within the regulation limits.

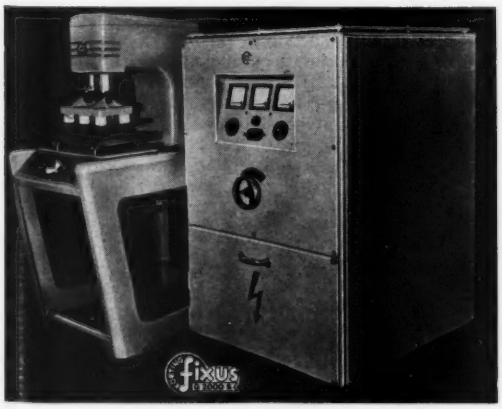
C. Lorenz, A.G., Stuttgart. This company produces both h.f. pre-heating and welding equipment. Principal advances have been in the ingenious system devised for automatic or semi-automatic operation. For example, an inflatable toy crocodile 130 cm. (4 ft. 8 in.) long was being produced at the Fair on an automatically operated moving electrode, the weld being produced in a number of stages. Operation of the cycle is entirely automatic, i.e., when the two sheets have been placed in position a button is pressed, the mould table slides under the flat top electrode. The electrode is then depressed for a fixed welding time. When it is raised again, a relay operates the table, moving it to the next welding station. Thus a complete article can be welded in up to six stages, each with a predetermined welding time.

In welding p.v.c. sheeting the time occupied in loading is often greater than the actual welding time. Lorenz have therefore developed a system of coupling two welders to a single generator, operating these alternately. A special safety device prevents one welder being operated whilst current is being taken from the other.

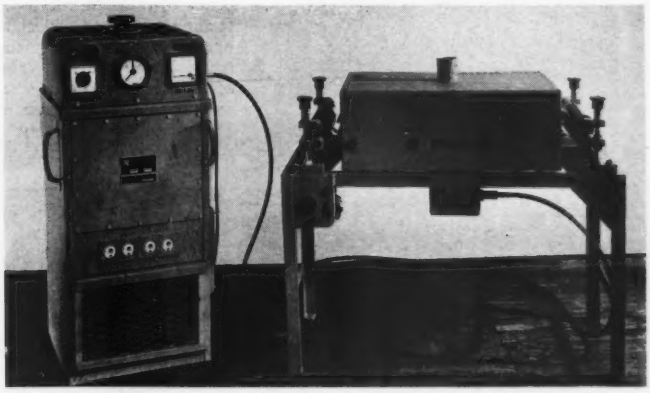
Alfred Schwalbach, K.G., Hamburg. This company provides a range of welders from 300 to 4,000 kW. capacity, using Herfurth generators. The latest model, Primus 600, has a neat modern design cast head, mounted on a wide workbench under which the generator is fitted. It is pedal operated and claimed to be extremely versatile. Schwalbach also produce a welder operating on the sewing machine principle, a series of rapid short welds being made in a continuous line. The company produces tools to customers' requirements as well as a range of standard welding tools. They are represented in Britain by H. F. Industrial Services, Fairfax Road, London, N.8.

Calenders and Mixers

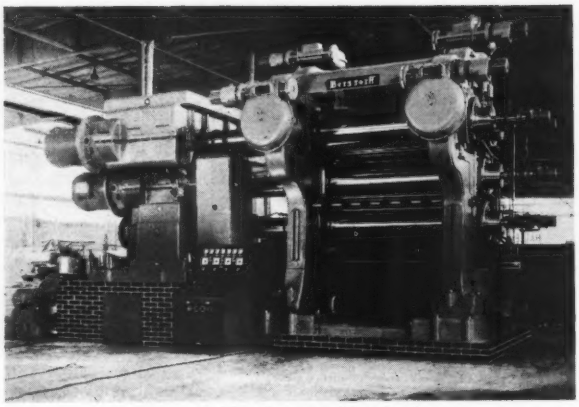
Hermann Berstorff Maschinenbauanstalt G.m.b.H., Hanover, showed a four-bowl inverted "L"-type rubber and plastics calender developed for use in the production of conveyor belting. The machine, which weighs 108 tons, has bowl dimensions of 1850 x 700 mm. (73 x 27½ in.). The bowls are driven separately by four 75 h.p. motors through articulated couplings. This has proved as effective as a single motor unit driving the bowls through a common reduction gear and has the added advantage of making operation easier and more flexible. Friction ratios up to 2 : 1 are obtainable between any two bowls. The



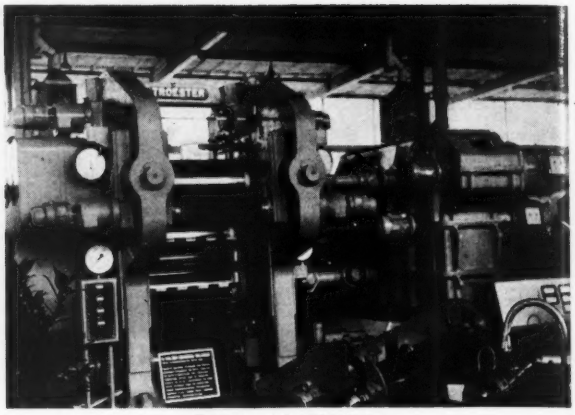
Fixus G 2000 S 2kW welder by Körting, designed for production of book covers.



H.F. generator and electrodes with roller conveyor for drying and setting synthetic resin textile finishes.



Berstorff 4-bowl inverted-L calender.

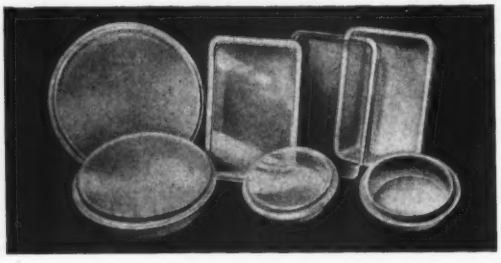


Troester 4-bowl calender.

illustration shows the machine installed at the Fair—the largest exhibit in the hall devoted to plastics machinery. The motor housing and reduction gears are housed separate from the bowls, one of the advantages being to facilitate temperature control. The control panel is seen in the centre foreground. Berstorff are represented in Britain by International Corporation, Ltd., 19 Ebury St., London, S.W.1.

In addition, Berstorff introduced a new device for use with twin-roll mixing mills or stock blenders to enable automatic mixing without the heavy manual work normally involved in lifting the mix. The sheet as it emerges from the rolls is lifted and passed between two guiding bars through a pair of nip rollers and back into the mill. The guide bars move horizontally backwards and forwards across the face of the rolls and ensure a constant mixing action.

Buss A. G. Basle/Pratteln, Switzerland, produce a series of screw-type mixers suitable for compounding and colouring plastics. The principle of operation depends on the friction imparted to the material by being driven by a screw with interrupted threads through a barrel having "kneading teeth" protruding into the casing. Buss, who are represented in England by Aldersley Agencies, Ltd., Tettenhall, Wolverhampton, have supplied these "Ko-Kneaders" to several British companies. Heating can be arranged for steam, water or oil in several controlled zones. The barrel is in two parts, hinged together, and easily split open to facilitate cleaning. Accessory equipment can include a rotary granulating head for the manufacture of injection-moulding chips.



(Above) The Hansatherm machine automatically forms thermoplastic sheets into containers (right) which are subsequently sealed by h.f. moulding.

Sheet-forming Equipment

The Swiss Form-Vac vacuum moulding machine manufactured by Hydro-Chemie, of Zurich, aroused great interest, being the first machine of its kind to be seen in Germany. Readers of *Plastics* will remember that an article on vacuum forming, referring to the Form-Vac machine, appeared in *Plastics*, March, 1954, page 99.

One of the most novel plastics machines was the "Hansatherm" box-forming unit built by Rathke and Schultz K.G., Hamburg, 24. It has been designed to make containers from pre-cut sheets of thin rigid p.v.c. by mechanical drawing. Except for feeding preforms and starting the cycle by pressing a button, the machine is automatic; consequently the units are built up in sets of 2, 4 or 8, which can be operated by one worker (two in the case of the largest set). The process is analagous to the drawing of sheet metal into cans. Heating required is only 125 watts for each unit. Both heating and cycle time are controlled separately. Working temperature is about 125° C. Output for the 8-station machine is from 1,000 to 1,500 boxes with lids per hour, using preforms of 100 mm. diameter (4 in.). Boxes and lids so formed are flanged by means of a two-stage operation. This enables the containers to be filled and subsequently closed by h.f. welding in a machine with ring electrodes, specially contructed to go with the Hansatherm equipment. As illustrated, there are several shapes and sizes of boxes which can be made on the machine.

This packaging system is intended (and has already been used) for packing foodstuffs which do not require sterilizing in the container. With this limitation—due to the thermoplastic nature of the foil employed—many products can be cheaply and attractively packed, e.g., pickles, olives, herrings. Containers or lids can be printed by a variety of methods, printing usually being done on the pre-cut flat sheet. The two-unit model E2 is illustrated here, showing the neat design of the machine and the mounting of cycle time and temperature controls.

Besides the Hansatherm machine and the high-frequency welding unit to go with it, Rathke and Schultz also showed other types of welding and heat-sealing equipment, including machines for the manufacture and sealing of polythene film from sheet or from lay-flat tubing.

Miscellaneous Equipment

Compression moulding machines were only shown on one stand—Hahn and Kolb, who are selling agents for Johs. Krause G.m.b.H., Hamburg. These machines have a ring-type solid frame. The latest model, a self-contained press incorporates timing mechanism enabling the machine to be operated automatically.

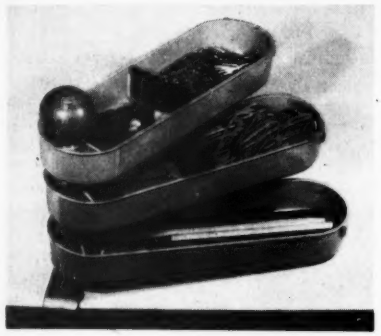
Hahn and Kolb also showed a hydraulic pelleting machine, Type TP25, made by W. Bussmann K.G. Advantages claimed for this machine are automatic operation and application of even pressure from two sides. The pelleting press is driven by a three-stage pump giving maximum economy.

Paul Troester Maschinenfabrik, Hanover, who have already been mentioned in connection with their range of extruders, also exhibited a four-bowl inverted L calender of modern design.

New Productions

Office Accessory Container

Using basically the same parts as the Visipart assembly tray described in *Plastics*, October, 1953, page 356, the British Central Electrical Co., Ltd., 6-8 Rosebery Avenue, London, E.C.1, have now produced the Multipart desk unit suitable for keeping pencils, pins, paper clips, etc., neatly on an office desk. Three swivelling polystyrene trays are mounted on a shaft which may be clamped to the edge of any desk. Each of the trays may be subdivided if required.



Multipart desk tidy.

Meter Casing

To protect the Avo Universal photo-cell exposure meter manufactured by Automatic Coilwinder and Electrical Equipment Co., Ltd., 21 Douglas Street, London, S.W.1, an injection-moulded one-piece case has been developed by Creators, Ltd., Sheerwater, Woking, in collaboration with Avo. The flexible p.v.c. housing fits neatly over the phenolic case of the meter itself and protects it not only from shock but also from exposure to severe weather conditions. The case remains on the meter while in use, the front cover opening by means of an integrally moulded hinge. Instructions for the use of the exposure meter have been reproduced in relief on the back of the housing whilst the trade mark is "embossed" on the front. Besides the neat appearance and usefulness of the case the fact that it is moulded in one piece enables it to be produced at a lower cost than the hand-stitched leather case which it replaces.

Polyamide Engineering Components.

The properties of the polyamides have made them particularly suitable for use in engineering components, among other purposes in chemical equipment resistant to alkalies. The British Rawhide Belting Co., Ltd., 246-8 Great Portland Street, London, W.1, are manufacturing balls machined from Akulon rod (supplied in this country by Hercules Powder Co., Ltd., 140 Park Lane, London, W.1). The ball illustrated is used in an ammonia slurry valve. It replaces phosphor-bronze balls. Whereas these were used at the rate of 1,000 per annum, the Akulon parts have been supplied at the rate of only 50 per annum.

British Rawhide Belting Co., Ltd., also machine various components for milk-handling machinery where again the life of nylon is very much greater than that of metals. Examples include the two homogenized packings in our photograph.

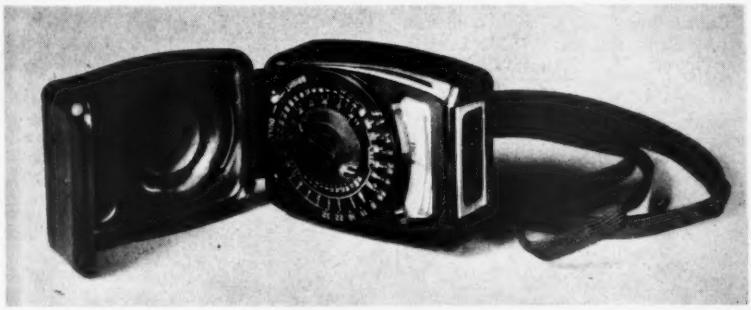
Akulon ball for valve and two Akulon ring packings.

Light Diffusers for Fluorescent Lamps

To improve the effect of fluorescent lighting, Philips Electric, Ltd., Century House, Shaftesbury Avenue, London, W.C.2, have designed diffuser screens moulded from clear transparent polystyrene. The great advantage over existing diffusers, which are normally mounted separately and made in sections corresponding to the fluorescent tube, is that the Philips diffuser screens are made in short interlocking sections which clamp directly on to the lamps themselves. Each unit is 8 in. long, thus various numbers can be combined to make a complete screen for different sizes of lamps.

Venetian-blind Ladder Web

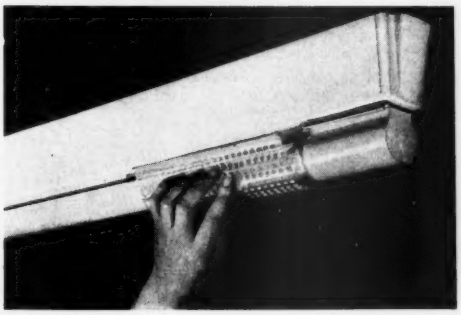
To meet a demand caused by the growing popularity of venetian blinds, Thomas French and Sons, Ltd., of Manchester, are now producing "Fleurette" plastic-coated ladder web for use in conjunction with venetian-blind slats. By coating and embossing the outer surface of the "ladder" a neat and colourful appearance is obtained and cleaning is made easy—the plastic surface requiring only occasional wiping

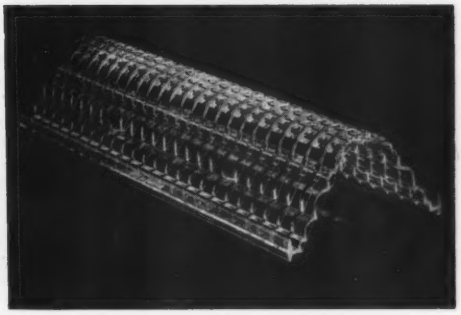


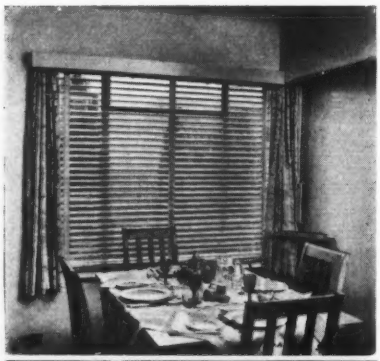
(Above) Avo Universal exposure meter with moulded flexible p.v.c. case.

(Above, right) Embossed instructions are incorporated in the moulding.

(Right) Philips polystyrene fluorescent light screen units.







(Left, above) Venetian blinds made by Crittall Manufacturing Co., Ltd., can be fitted with "Fleurette" plastic-coated ladder webs.

(Left, below) A section of the ladder web.

(Right) Lubricating oil dispensing pens.

down with a damp cloth. The construction of the ladder can be seen from the close-up of the small sample.

The illustration of the blinds made by the Crittall Manufacturing Co., Ltd., shows the type of installation for which the new production is intended.

Lubricating Oil Dispenser

The Lubristyl oil pen is intended to replace the conventional oil can. It enables oil to be put accurately where required without any danger of soiling adjacent points. The oil pen is claimed to be completely leakproof and suitable for carrying in the pocket; it can be used in any position, even upside down. There are three types, for uses varying from general household to precision instruments. The housing for the pen is injection moulded by J. F. Kenure, Ltd., Faggs Road, Feltham, Middlesex, for the distributors, C.I.D.I.S., 17 Montpelier Place, London, S.W.7.

The instrument has been adopted by the Admiralty for use with radar and other sensitive apparatus.

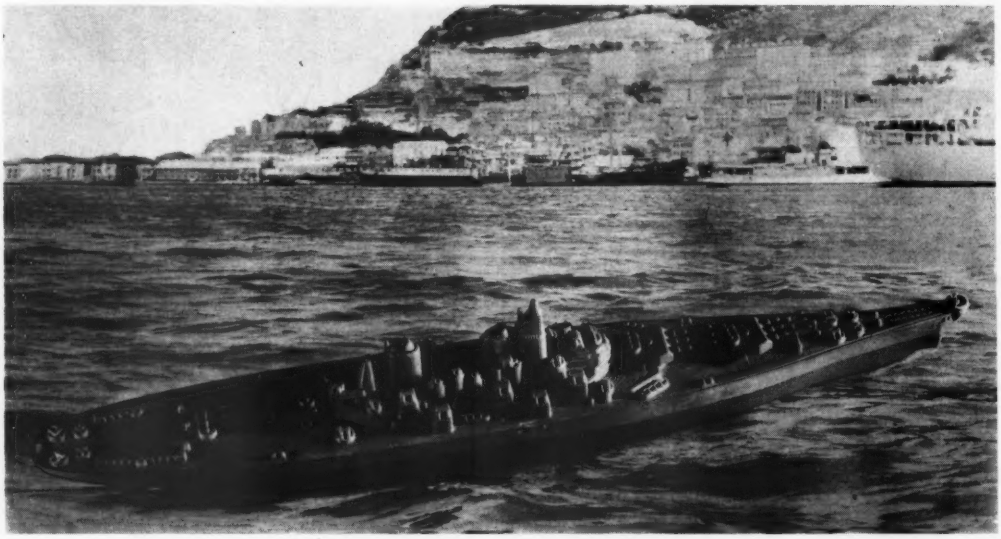
Toy Battleship

The 16-in. long model of the U.S. battleship "Missouri" is being produced by O. and M. Kleemann, Ltd., West Halkin Street, Belgrave Square, London, S.W.1, using the new D/S grade Kleestron polystyrene. This grade of material has been chosen to facilitate extraction of the moulding from the tool. As can be seen from our photograph, there are many small detail features which would cause difficulties with a standard grade of polystyrene.

Weed-killing Device

A new weed-killing instrument is manufactured in the U.S.A. from a length of extruded cellulose acetate butyrate tubing. The lightweight tube is filled with a weed-killing solution which, when the tube is placed over the centre of the weed, diffuses through a sponge stopper. This provides a metering device and also prevents the weed killer from affecting the surrounding plants. The amount of solution can be observed through the transparent walls of the plastic tube. Called the Weed Wand it is manufactured by Gro-quick Sales, 10342 Lanark Avenue, Detroit, 24, Michigan, from tube extruded by Detroit Macoid Corporation, Detroit, 4, using Tenite II cellulose acetate butyrate produced by Eastman Chemical Products, Inc., Kingsport, Tennessee. Tenite II is supplied in Britain by Kodak, Ltd., Kingsway, London, W.C.2.

(Above) Weed-killing device made from cellulose acetate butyrate tube.



(Left) Toy battleship moulded from destaticized polystyrene. Our photographer seems to think that a battleship of this size can enter Gibraltar harbour.

Plastics NEWS

Raw Materials, New Plant, Works Organization, Control Apparatus, Research, Personal and Trade Notes

New batch counter for solving measuring problems.

BATCH COUNTER.—We have received details from Airmec, Ltd., High Wycombe, Bucks, of a new batch counter, type N808, designed to solve counting, packing and measuring problems. Many mass-produced articles need to be separated into batches of a given quantity and the batch counter enables this work to be carried out at high speed and very efficiently. The maximum counting speed is 3,000 per second.

VACUUM FORMING MACHINES.—Two companies have recently announced the introduction of vacuum forming machines. The Pulsometer Engineering Co., Ltd., Nine Elms Iron Works, Reading, are at present marketing two units, the first having a single moulding platen 24 in. by 24 in. and the second having twin platens with internal dimensions 2 ft. 9 in. by 2 ft. 9 in. The company is also quoting for machines with platen areas of 36 in. by 66 in.

W. Edwards and Co. (London), Ltd., of Crawley, Sussex, have introduced the vacuum forming machine model VF2 which has a maximum moulding area of 22 in. by 25 in. Photographs of both these machines are reproduced below.

INDUSTRIAL VACUUM CLEANERS.—Filtavac Ltd., 64a Kensington Church Street, London, W.8, have introduced a new model RM22, which cleans up to a height of 25 ft. without auxiliary equipment. In addition, by means of a special cleaning head, dirt and debris can be removed from the tops of beams while operating from ground level. A variety of cleaning heads are available to suit individual requirements.

LIQUID LEVEL CONTROL SYSTEMS.—Amongst literature recently circulated by Londex Ltd., Anerley Road, London, S.E.20, is leaflet No. 941F, which describes a liquid level system which does not make use of a float. One of the features of the unit is that it acts as a safety device, preventing a tank being overfilled or alternatively being emptied to such an extent as to necessitate repriming the pump. Of particular value to the chemical industry is the use of the machine to control a pump or valve to draw a known quantity of liquid from a tank and then to refill it automatically.

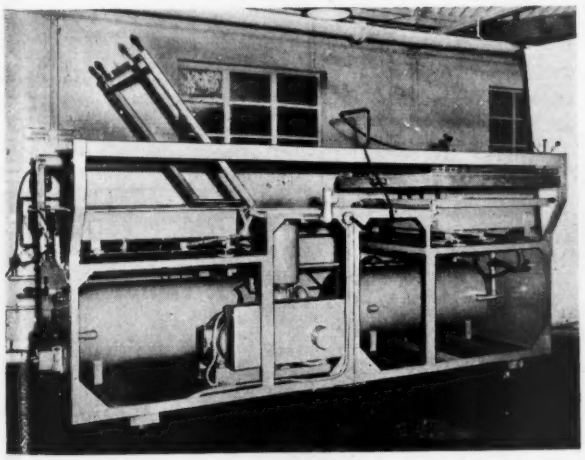
UNBREAKABLE GUILLOTINE FOR PLASTICS.—F. J. Edwards, Ltd., 359-361 Euston Road, London, N.W.1, have introduced the Besco all-steel fabricated unbreakable hand lever guillotine. The machine has a blade range of 4½ in., and toggle-operated hold-down is provided. Side squaring gauges are also fitted.

PECO 2½-IN. EXTRUDER.—The bulletin "Quarterly" issued by the Projectile and Engineering Co., Ltd., Acre Street, London, S.W.8, contains news of the development work that has been carried out with the 2½-in. extruder. Notes are also included on injection moulding efficiency, resulting from work carried out by the plastics development division of the company.

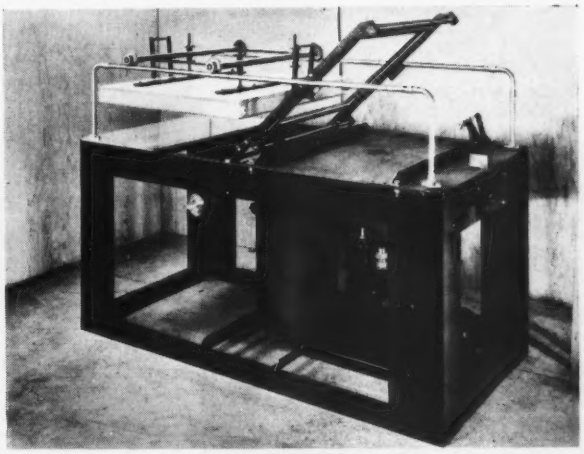
SYNTHETIC RESINS FOR FOUNDRY SAND CORES.—The use of synthetic resins as core-binders in the foundry world is now generally accepted as established practice with many progressive foundry firms. However, one factor which has been regarded by some foundries as a disadvantage in using synthetic resins, particularly the urea type, is the odour given off when casting takes place. No one would claim that the casting odour from linseed oil is particularly pleasant but, at any rate, foundrymen, generally have, from long usage, become so accustomed to it that they accept the odour uncomplainingly. Some, however, do not take so tolerantly to the new odours emanating from the use of synthetic resins. Constant research has been carried out by British Industrial Plastics, Ltd., ever mindful of the Garrett Report, to improve their well-known W.20, the essential aim being to obviate or very largely reduce the characteristic odour resulting from the use of urea resins, at the same time maintaining their economical virtues. This has resulted in the introduction by B.I.P. of their new foundry resin Beetle W.42, which, in addition to having reduced casting odour, possesses all the advantages of the well-known Beetle W.20.

MALEIC ANHYDRIDE. — Monsanto Chemicals, Ltd., announce that the company will shortly begin the construction of a major plant to manufacture this material by the direct oxidation of benzene. The plant's production should be sufficient to cater for all the known needs of industry in Britain, and the design of the plant will permit rapid expansion to meet any future growth in demand. Maleic anhydride is a basic industrial chemical used as a raw material for the manufacture of alkyd and polyester resins employed in the paint and plastics industries.

MASS COLOURATION OF PLASTICS.—An interesting booklet has recently been issued by the Dyestuffs Division of I.C.I., Ltd., dealing with the mass colouration of cellulose acetate, polystyrene and polythene moulding materials. Detailed information is included on the various colouring matters which are available for use in this way, together with details of their light fastness, heat stability and ease of dispersion.



New twin-platen vacuum forming machine now being made by the Pulsometer Engineering Co., Ltd.



New single-platen vacuum forming machine, model VF2, by W. Edwards and Co. (London), Ltd.

RETIREMENT OF MR. A. E. PHIPPS.—After 37 years with the General Electric Co. Ltd., Mr. A. E. Phipps, deputy general manager of the company's Witton Moulded Insulation Works, has retired. At a farewell dinner party, Mr. R. J. Kaula, general manager of the works, presented him with a silver tea service and tray on behalf of his many friends and colleagues. Mr. Phipps joined G.E.C., as a chemist in 1917. After 10 years in charge of research development and production of battery boxes he became deputy general manager in 1938. Well known in the plastics industry Mr. Phipps was chairman of the Midland Sub-Section of the Moulders Group of the British Plastics Federation in 1952-53.

Mr. A. E. Phipps (left) and Mr. R. J. Kaula.

GOLF.—The Plastics Industry Golfing Society met at Wentworth on June 23 to compete for the Australian Shield, presented by Len Herman, Australian agent for British Resin Products, Ltd., the Waghorne Trophy, and the *Plastics* Goblets. Mr. Herman was present in person to present his trophy, having arrived the same day from New York. The winner was Mr. Peter Brown, of British Resin Products, Ltd., 39½ points, the runner-up being Mr. F. Pullen, of E. K. Cole, Ltd., 31 points. Mr. W. C. Waghorne presented his trophy to Mr. D. Brooke-Hitching, Ranton and Co., Ltd. (35¾ points), the runner-up being Mr. H. E. Harden, Erinoid, Ltd. (35½ points). Mr. Roland E. Dangerfield, chairman and managing director of Temple Press Ltd., presented the *Plastics* Goblets to Mr. D. Sullivan, Erinoid, Ltd., and Mr. P. J. N. Collaro, Collaro, Ltd., who were the winners with 37⅞ points, the runners-up being Mr. C. Parkinson, Amalgamated Plating Co., Ltd., and Mr. C. J. French, *Plastics*, with 35⅞ points.

(Right) Some of the guests at a dinner recently held for employees of Synthite, Ltd.

MR. T. A. ST. JOHNSTON, who recently celebrated his seventieth birthday, has retired after 37 years with the Micanite and Insulators Co., Ltd., Walthamstow, E.17. He commenced his career at the British Thomson Houston Co., Rugby, in 1901, later joining West Ham Corporation and then St. Marylebone Electricity Supply. Mr. St. Johnston joined M. and I. in 1917 and has always been held in high esteem by all his colleagues. To mark their appreciation of his activities the Foremen's Association, the Long Service Association and M. and I. Sports Club made presentations to Mr. St. Johnston. His friends trust that he will enjoy many years of activity and excellent health.

MR. FRANCIS A. FAWCETT, has been appointed a director of David Bridge and Co., Ltd. He joined David Bridge on January 1, 1954 as sales and commercial manager and recently returned from the U.S.A. after two months study of new rubber and plastics machines which the company are marketing.

MR. C. E. HOLLIS, B.Sc., F.R.I.C., has been transferred to the Central Personnel Department of The Distillers Co., Ltd., as staff manager (Industrial Group). Mr. Hollis was previously manager of the Plastics Division at the company's Research and Development Department, Epsom.

SYNTHITE, LTD.—At a recent dinner, the chairman of Synthite, Ltd., Mr. G. H. Duncan, presented gold watches to over 20 employees, including three directors, who had served the company for more than 25 years; altogether 150 employees were present. Mr. R. B. Robinson, in proposing the toast of the company, drew attention to the fact that Synthite, Ltd., were producing synthetic resins as far back as 1917, continuing until 1922 when the production of formaldehyde became the main effort of the company.

SWEDISH VISIT TO B.I.P.—An interesting talk, supported by coloured projected illustrations, was given recently to over 100 members of the B.I.P. Group, at the Streetly Works, by Mr. H. Berlin, technical director of plastics of L. M. Ericsson, A.B., Sweden. Introduced by Mr. C. S. Dingley, Mr. Berlin said that the plastics industry in Sweden was well abreast of all modern techniques and he described an ingenious idea for synchronizing a high-frequency pre-heater with a press cycle.

WICKMAN LTD.—Mr. G. R. Marsh, who has been a director of the company for 14 years, has now been appointed managing director.

MR. W. J. REYNOLDS, has been appointed sales director of Rubber Improvement, Ltd. For the past six years he has held the appointment of northern area sales manager in Manchester.

O. AND M. KLEEMAN, LTD.—Mr. Alfred Drucker was appointed to the board on June 1.

(Below) Mr. W. C. Waghorne congratulates Mr. D. Brooke-Hitching, winner of the Waghorne Trophy.

(Below) Mr. Peter Brown receives the Australian Shield from Mr. Len Herman.

(Above) Mr. Roland E. Dangerfield presents the *Plastics* Goblets to Mr. D. Sullivan and Mr. P. J. N. Collaro.

RESINOID AND MICA PRODUCTS, LTD., have retained the services of the industrial designer Mr. Robert Cantor, to deal with customers' styling problems. This represents an extension of the existing design service operated by the company.

W. W. BALL AND SONS, LTD.—Mr. D. O. V. Ball, Mr. C. H. Brandis and Mr. T. R. J. Lewis have been appointed to the board of directors.

MR. NORMAN BURTON.—We regret to record the death on May 26 of Mr. Norman Burton, who for 40 years represented the Micanite and Insulators Co., Ltd., in Cheshire, Lancashire and Yorkshire. A man of charming personality he was well known in the north and was actively engaged in his office only two days before his death.

PATENTS OFFICE.—The President of the Board has approved the appointment of Mr. J. L. Girling, a superintending examiner in the Patents Office, as comptroller-general of patents, trade marks and designs in the place of the late Sir John Blake. Mr. Girling joined the Patents Office in 1921.

SCHOLARSHIPS IN PLASTICS TECHNOLOGY.—The trustees of the Plastics Institute education fund have granted £2,000 to the College of Technology, Birmingham, for the award of scholarships for a two-year course leading to the Associateship of the Plastics Institute. These scholarships are being offered for the 1954/55 session, commencing on September 20. The value of the scholarship will be £200 and it is anticipated that in certain cases holders of a scholarship may not be called upon to pay tuition fees. Further details and application forms may be obtained from the Registrar, College of Technology, Birmingham.

CHEMICALS AND PLASTICS MATERIALS EXHIBITION to be held in Paris from December 2 to 12 this year. The programme of events includes the third conference on chemical engineering, the first conference on corrosion and a special symposium on plastics. Plastics raw materials, intermediate products, fabricated goods, and plant and equipment will be on display and full details can be obtained from the Commissariat General, 28 Rue Saint-Dominique, Paris 7.

THE SURFACE DYEING OF CELLULOSE PLASTICS.—A technical circular, published by Imperial Chemical Industries, Ltd., this booklet offers valuable information on the aqueous and solvent methods of surface dyeing cellulose acetate and nitrate.

BRITISH INDUSTRIAL PLASTICS, LTD.—The northern area office of the company is now at 79 Mosley Street, Manchester, 2.

PERMALI LTD.—The London office of the company has now been moved to Windsor House, 46 Victoria Street, London, S.W.1, telephone Abbey 6494.

CHELTENHAM PLASTICS LTD., has moved to Crawley, the new address being Tinsley Lane, Crawley, Sussex.

LEAVES FROM A MOULDER'S NOTEBOOK.—A revised edition of this booklet, published by British Industrial Plastics Ltd., 1 Argyll Street, London, W.1, has just been issued. In his introduction, Mr. James Butler says "Any attempt, therefore, by any moulder to describe the moulding problems he has encountered and the means he has used to overcome them, can only be to the common good, whether the methods are the best that could be used or not." "Leaves from a Moulder's Notebook" is a record of such an attempt and as such will be of the greatest interest to moulders throughout the world.

FACINGS OF POLYTETRAFLUORETHYLENE.—Gasket covers have previously been made by cutting from large cylinders of p.t.f.e. A new method for moulding these directly from "Fluon" p.t.f.e. powder has been developed by I.C.I. Plastics Division. The powder is spread in an annular compression mould. A ring of tracing cloth which reaches to the outer wall of the mould, but not to the central portion, or vice-versa, is placed on this layer. A further layer of p.t.f.e. powder is placed on this cloth and compressed to about 300 lb./sq. in. As the moulding produced is fragile, the tracing cloth should be in two halves. so that it can then be withdrawn easily. The moulding is heated to about 360° C. for about 1½ hours to obtain a strong heat- and chemical-resistant gasket cover. Any smooth powder-impermeable ring which allows the transmission of pressure to the p.t.f.e. may be used in this process in the place of tracing cloth. If an annular mould is not used in this process, Saunders valve facings of the type described in BP696545 may be produced.

ROYAL SOCIETY OF ARTS INDUSTRIAL ART BURSARIES COMPETITION, 1954.—Particulars have been published of the Art Bursaries Competition sponsored by the Society. Among other sections, bursaries of £150 each will be offered for designs of laminated plastics and of Perspex articles. Conditions in the relevant sections are:—

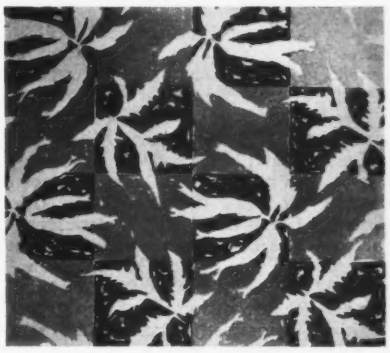
Plastics Section. Three designs for reproduction in any surfacing material for items in at least two of the following categories: table tops, wall or door panels or articles of furniture to be used in any building.

Perspex Section. Three designs for articles suitable for household use and/or commercial use to be made from Perspex.

The Competition is open to British subjects between the ages of 17 to 30 who must be full-time students. Full details are obtainable from the Royal Society of Arts, Adelphi, London, W.C.2.

ART BURSARY AWARDS FOR 1953.—Published concurrently with the above announcement of the 1954 Competition is the report of the juries for last year's Competitions. Only three candidates entered in the Perspex Section. The jury felt that in the limited entry the technical problems involved in manufacture and the opportunities offered by the transparency and other characteristics of the material had not been fully understood. It was decided to recommend that the Bursary be awarded to Mr. K. Ryan whose designs were interesting and more accomplished than those of the other two candidates.

In the P.V.C. Plastics Sheeting Section the jury commented on the fact that the candidates had for the first time been provided with pieces of p.v.c. sheeting on which to submit examples of work. This had enabled candidates to appreciate the nature of this medium, but some examples had been spoilt



A design of the winning candidate in the p.v.c. section.

by the absence of suitable inks. The Bursary was awarded to Miss Margaret Capell of the L.C.C. Hammersmith School of Building and Arts and Crafts.

Plastics in the Service of Man

The following is a list of full names and addresses of companies mentioned in the illustrated feature "Plastics in the Service of Man" which appears on pages 218 to 221 in this issue:—

49. Commercial Vehicles—2

AC-Delco Division of General Motors, Ltd., Dunstable, Beds.
Allis-Chalmers Manufacturing Co., Tatton, Southampton.
Autowire and Maintenance Co., Ltd., 92 Earls Court Road, London, W.8.
B.E.V. electrical trucks—Wingrove and Rogers, Ltd.
Birmingham and Midland Motor Omnibus Co., Ltd., Edgbaston, Birmingham, 16.
Clearex Products, Ltd., Wembley, Middlesex.
Commer Cars, Ltd., Luton, Bedfordshire.
Thos. De La Rue and Co., Ltd., 84 Regent Street, London, W.1.
Douglas (Sales and Service), Ltd., Kingswood, Bristol.
Dover, Ltd., Northampton.
Doverite—see Dover, Ltd.
Duple Motor Bodies, Ltd.
Frederick W. Evans, Ltd., Long Acre, Birmingham, 7.
Ferodo, Ltd., Stockport, Cheshire.
Gandy, Ltd., Wallasey, Cheshire.
General Celluloid Co., Ltd., Hanworth Road, Hounslow, Middlesex.
Hellermann, Ltd., Tinsley Lane, Crawley, Sussex.
Imperial Chemical Industries, Ltd., Plastics Division, Welwyn Garden City, Herts.
Injection Moulders, Ltd., Westmoreland Road, London, N.W.9.
Leyland Motors, Ltd., Leyland, Lancashire.
Litholite Insulators and St. Albans Mouldings, Ltd., Watford, Herts.
Mulliners, Ltd., Bordesley Green Road, Birmingham, 8.
P.D.I., Ltd. (Plastics Developments Industrial), 60 Livery Street, Birmingham, 3.
Perspex—see Imperial Chemical Industries, Ltd.
Tenaplas (Sales), Ltd., Upper Basildon, Pangbourne, Berks.
Wilmot Breeden, Ltd., Amington Road, Birmingham, 23.
Wingrove and Rogers, Ltd., Mill Lane, Liverpool, 13.

TALKING SHOP . . .

German Styrene Process for U.S.A. A German process for the manufacture of styrene monomer is being introduced into America by the Foster Grant Company Inc., whose main activities have been in the moulding field. It will be the first time that a United States company will be making styrene by a method other than the process licensed by Dow Chemical Co. *The Financial Times*' U.S. industrial correspondent comments that it will also be the first small plastics moulder to "integrate downwards" to supply its own moulding material. The plant to be constructed at Baton Rouge, Louisiana, is forecast to produce 2m. lb. of monomer a month. Raw materials will be drawn from the adjoining Esso Refinery. The monomer is to be shipped to the Foster Grant parent plant in Massachusetts for polymerization. As a result of standardization and automatization only four men per shift will be required, to watch two continuous instruments controlling this process.

* * *

Button Standards. More news has been given of the committee set up to suggest a standard for buttons. Members will include representatives of the laundry and dry cleaning industries, garment manufacturers, button makers, supplies officers and plastics industry. Tests are now being carried out with the help of the British Laundries Research organization on causes of failure.

The Women's Advisory Committee about whose activities Dogsboddy writes on page 212 has also played an active part in the preparation of these standards.

According to a report in the London *Star* a spokesman for the Women's Advisory Committee of the British Standards Institution said that it may be some months before a draft standard for buttons will be formed.

Many complaints have recently been made by laundries, cleaners and consumers about inferior quality buttons and "plastics" are being blamed. Here is another case where insufficient knowledge of the variety of materials available and their different properties, together with lack of thought (or of scruples) by manufacturers are bringing the plastics industry into disrepute.

* * *

Meat Van. A meat van built by the Leicester firm of R. A. Neaverson and Sons has been lined with glass fibre reinforced plastics sheeting produced by Cascelloid Ltd. The glass fibre material is, of course, easily cleaned and is sufficiently strong to withstand abrasion by the meat during transit.

* * *

Non-tarnishing Metallic Yarn. Lurex is the name of a metallic yarn introduced in the United States some eight years ago by Dobeckmun Inc., of Cleveland, Ohio, and which has become very popular in the U.S.A. The yarn is made up of a combination of fine aluminium foil sandwiched between two thin plies of plastic film. A British associated company, Dobeckmun Overseas, Ltd., are now putting Lurex on the textile market in Great Britain. By the end of 1954 it is expected that factories will be in production both in the United Kingdom and on the Continent. Until then this yarn will be imported from the U.S.A. Lurex can be used like other yarns and woven or knitted into fabrics of wool, cotton, rayon or nylon. It is non-tarnishing and the metallic effects available are gold, silver and copper. By using a coloured transparent film metallic colour effects can also be obtained.

* * *

Mr. Peter Allen, a member of the main board of I.C.I., Ltd.'s, directors, has long cherished an interest in steam locomotives. His latest contribution to the literature in this field is *Locomotives of Many Lands*. The dedication is to the Secretary of I.C.I. and through him to the chairman and directors of the company, "for without many travels on the affairs of that company I should never have been able to write it." Mr. Allen became joint managing director of I.C.I. Plastics Division in 1942, chairman of that division in 1948 and was promoted to the main board in 1951. He is director in charge of paints, plastics and leathercloth, and has also since become responsible for the "Terylene" Council.

* * *

All-plastic Sailplane. Development plans for an all-plastic sailplane are now under way at the Kirbymoorside, Yorkshire, factory of Slingsby Sailplane, Ltd. The material to be used is a fibre-glass laminate. Mr. F. N. Slingsby told the *Yorkshire Post* recently that the first all-plastic sailplane would be ready probably in two years' time.

"We have a lot to learn yet about fibreglass laminate," he said, "but we know a good deal now, and I am confident that we shall do the job. We shall start by making main components for sailplanes and then build up from there as we get to know how the plastic substance responds both on the ground and in the air. For instance, we must know how it will weather."

Mr. Slingsby expects that plastics will cut the price of sailplanes by about half and hopes to sell them at about £500 each. Some plastic components are already under construction and the T42 two-seater to be flown by the British team in the International Gliding Championship to be held in Derbyshire this month will have such components.

* * *

Melamine Table Ware. *The Sunday Dispatch* recently reported that British Railways are now experimenting with "an unbreakable resin cup in an attempt to save £75,000 that is lost each year through breakages." These cups are in fact Melaware, the melamine tableware moulded by Ranton and Co., Ltd. The selling agents for Ranton are L. E. Witney (London), Ltd.

Mr. Witney, managing director of this company was formerly concerned with the development of polythene bottles in this country and achieved considerable success in making "squeeze bottles" popular. The melamine cups have already been supplied to British Railways and are now in use at Brighton, Waterloo and Paddington station buffets.

Industrial canteens are also becoming interested in the cost saving achieved by use of melamine ware. 200 such canteens have been equipped with plastic cups during the past nine months. One of these, Wakefield Oil Co., during 70 days served 94,500 cups of tea and coffee—the total loss during this period was 25 cups. During a similar period using china ware the average loss would be 375 cups.

Mr. Witney forecasts a great future for melamine in this country and draws a parallel with the U.S.A. where last year about 25 million dollars worth of melamine tableware was sold.

* * *

Toxicology. The provisonal programme of the International Congress of Industrial Medicine to be held in Naples from September 13 to 19 contains a number of interesting papers. One of these has the title "Toxicology of Plastic Substances in Relation to Industrial Hygiene."

* * *

Plastics on the Move. What is believed to be a new innovation in selling plastics to the public has been set rolling by I.C.I., Ltd. A mobile exhibition unit for the Plastics Division has been specially designed and built to tour agricultural shows up and down the country throughout the summer months. Based on a 3-ton Bedford chassis, the bodywork is so constructed as to open out and reveal a comfortable lounge with separate office and kitchen. Display units are stored inside the van when on the move and are readily assembled to provide a comprehensive exhibition featuring "Alkathene" tube and corrugated Perspex—two materials of particular interest to farmers. The coachwork, constructed by Park Royal Vehicles, Ltd., and the displays, built by Peak Displays, are so well integrated that it is possible for the whole exhibition to be completed by two men a few hours after arriving at a site. A facia board and canvas canopy combined with the photographic panels which screen the van, give the impression of a permanent exhibition stand. As "proof of the pudding" a number of plastics materials have been used in the construction of the unit itself. The interior walls and ceiling are lined with "Vynide" p.v.c. leathercloth which is used also for the upholstery of the built-in seats and portable furniture. Skylights are fabricated from opal Perspex sheet and "Darvic" p.v.c. sheet is extensively used for display facings. Perspex was also used to fabricate the hand wash basin and all plumbing is carried out in "Alkathene" tube. Formica laminated sheet for table tops and p.v.c. flooring complete a handsomely finished interior. The exhibition unit will be visiting nineteen major shows and travelling over 2,200 miles including Scotland and North Wales. The interest shown in the unit at the first of these shows has been very promising.

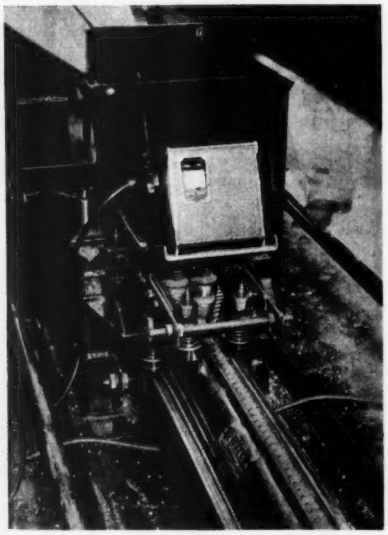
PLASTIKON.

Mechanical Handling Exhibition, 1954

A Brief Review of Some of the Interesting Developments which were to be seen at This Year's Exhibition

THE place of mechanical handling in modern industry was effectively demonstrated by the Fourth Exhibition held in June at Olympia. There over 200 exhibitors displayed aids to mechanical handling ranging from the world's largest mobile crane to the world's smallest electric pallet truck. Concurrent with the exhibition was a convention, together with the Second European Mechanical Handling Conference. Papers read at the convention ranged from bulk handling by transporters to belt conveyors. This last mentioned paper was read by Mr. T. R. Mackie, who made reference, in his address, to p.v.c. belting. Stating that the introduction of this kind of belting was initially due to development work in the mines as a safety measure to devise a flameproof belting, he went on to infer that the field for p.v.c. belting was greater than might at first have appeared. Tests have shown that in terms of abrasion resistance at least, the life of a p.v.c. belt will be very much longer than that of its rubber counterpart and the steel and engineering industries are, therefore, showing increased interest in this type of belting. He also made mention of p.v.c./acrylonitrile which appears to offer certain advantages over p.v.c. alone, being a more flexible material. Attention was also drawn to the very important point that the incorporation of a proportion of acrylonitrile type of synthetic material will enable p.v.c. belting to be processed with the aid of standard equipment already in use in the manufacture of rubber-based conveyor belting.

One of the most significant developments to be seen at the exhibition was on the stand of Rownson, Drew and Clydesdale, Ltd., 225 Upper Thames Street, London, E.C.4, who showed the unique Zipper closed belt elevator conveyor. As will be seen from the photograph, this belt consists essentially of a stout fabric-rubber base to which are fixed two walls, moulded at the top in each case into a zipper-like system of teeth. The unit on display, which was in motion, was conveying styrene moulding powder. A vibratory feed introduced the powder into a hopper, thus conveying it to the base of the endless belt moving at a fairly high speed. Simultaneously with the introduction of the powder into the belt, the two flaps were joined together and there emerged what was virtually a closed tube, packed tightly with powder. One of the advantages of this system is that granules and the like can be carried over considerable distances, at high speeds, and taken round corners, either in the vertical or horizontal positions. The powder was delivered back on the stand at the other end of the vibratory unit, having been discharged by reopening the belt.



Zipper closed belt elevator conveyor. Here the belt can be seen emerging from the closing device. The hopper feeding the granular material into the belt is shown at the top of the picture. Flexibility is an important feature of this system.

The field of conveyors generally was well represented, including British Ropeway Engineering Co., Ltd., Conveyors (Ready Built), Ltd., and the Moxey Conveyor and Transporter Co., Ltd. Ingenious indeed were the methods of transporting articles of all kinds, ranging from bulk commodities such as coke to packing cases.

Among the well-known companies showing beltings, were Dunlop Rubber Co., Ltd., and Rubber Improvement, Ltd.

The Lamson Engineering Co., Ltd., illustrated a number of conveyor schemes recently completed by the company. Amongst the materials used in tube manufacture are cellulose acetate butyrate and polythene. A reference was made to these in an article in *Plastics*, January, 1954, page 8.

Fork trucks are a familiar sight in many factories and the principal development to be noted this year seemed to lie in the precision controls of these units. Versatility seems to have been the watchword of the fork truck designers who have produced units which not only hoist goods at a high speed but possess the ability of being able to turn round virtually in their own length, a highly important factor in a crowded warehouse.

In the field of packing, Imperial Chemical Industries, Ltd., plastics division, have co-operated with the British Tabulating Co., Ltd., in the development of an electronically controlled measuring, weighing and recording process. The unit, manufactured by the British Tabulating Machine Co., Ltd., automatically controls the feeding of all types of materials, controls the measured feeding of materials from different sources to predetermined formulae, registers weight, including gross weight of package and gross weight of consignment, and prints records, such as the gross weight of any individual package or gross weight of a series of packages. This system provides excellent safeguards for underweight, overweight and spoiled packages and greatly facilitates speedy dispatch operations.

An interesting lifting unit was shown on the stand of George Cohen, Sons, and Co., Ltd., the Hoistmaster. Available in sizes lifting from 5 cwt. to 5 ton, the Hoistmaster features include low maintenance costs, and worm rotating drive ensuring safety in event of brake failure.

A view of an electronically controlled automatic weighing machine manufactured and marketed by the British Tabulating Machine Co., Ltd.

Two items shown on the stand of the British Electrical Development Association appear to be of great interest to the plastics industry. The first is the Tektor J level control instrument for granular solids, liquids and bulky solids, marketed by Fielden (Electronics), Ltd., Wythenshawe, Manchester. With the aid of this instrument correct control of level can be maintained and might well have application in the control of feeds to injection moulding machines and extruders.

Another unit was the Bendix Ultra-Viscoson which measures, records and controls viscosity automatically and continuously. This unit has already been used in the manufacture of plastic materials and in the control of the viscosity of resins.

Shown on the stand of the Didsbury Engineering Co., Ltd., Manchester, was the Minilift hoist, having a total lift height of 12 ft. Simple to operate and capable of accurate control, the Minilift is made in a number of models, capable of lifting from 5 to 15 cwt. Stewart Gill and Co., Ltd., Hayes, Middlesex, showed conveyor units. The company specializes in conveyor systems for specific applications and has marketed units for latex curing and plastics heating.

A number of drum handling units were shown, including those of W. Langley and Co. (Mechanical Handling), Ltd., London, and Powell and Co., Burry Port, South Wales. Industrial Machine and Equipment Co. (Brimpex), Ltd., London, S.W.19 demonstrated a self-actuating lifter which is rapid in action, will lift from 2 to 2½ cwt. and has a lifting speed of 4 to 6 seconds for a 5-ft. lift.

The wider awareness of the function of mechanical handling in productivity levels was evidenced by the attendance both at the exhibition and the convention.

Accessory Equipment for Quality Moulding

By W. E. RAHM, Boonton Molding Co.

Representing one of America's largest moulding plants, Mr. Rahm contributed this article on quality moulding to the May issue Journal of the American Society of Plastics Engineers. We have pleasure in reproducing it herewith, by arrangement with the Society.

LISTED in the order of their importance are the items necessary for quality control.

Items 1 to 5, (1) Drying, (2) Mould Circulators for temperature controls, (3) Instrumentation, (4) Granulators, and (5) Screening reground materials. These I consider necessary items.

Items 6 to 10, (6) Weight feeding, (7) Hopper loaders, (8) Degating devices, (9) Annealing bath for nylon and cleaning machine parts, (10) X-ray machine. These I consider optional items predicated on the type and variety of items being moulded.

(1) Drying

Control of the moisture content of moulding materials is of primary importance and this involves drying of the moulding powder.

All materials manufacturers advocate drying the moulding powder to obtain the best results.

While slight amounts of moisture above those recommended by the manufacturer may be permissible in some plastic moulding powders and act as a plasticizer, this moisture does not improve the physical properties of the end product.

Moisture in acrylics, polystyrene and nylon causes splay marks, silver streaks, bubbles, and may cause adhesions.

Each material should be dried in a separate oven since vapours given off by one material can, and do, contaminate dissimilar materials. This is especially true of acetates with a high plasticizer content.

Therefore the need for drying equipment with accurate temperature control and the ability to obtain uniform results by proper loading of the pans. Material in the pans should be spread evenly and from 1 in. to 1½ in. deep for best results.

Drying eliminates the important variable in moulding.

Dryers are available in several types: 1. Hot air-circulating ovens. 2. Infra-red ovens. Not to be used for nylon as oxidation causes discoloration. 3. Steam ovens. 4. Hopper dryers mounted directly on the injection machine.

(2) Mould Temperature Controls

The temperature of the mould is just as important as the temperatures of the injection cylinder for the following reasons:—

1st—Proper mould temperature reduces strains in the moulded parts.

2nd—Makes it possible to mould thin sections over a larger projected area than would otherwise be possible.

3rd—Moulded parts have higher distortion and service temperature.

4th—Control of dimensional accuracy.

5th—Reduction in scrap loss when starting a new job.

Mould temperature controllers are of two types:—

1st—Recirculating type, in which the fluid is returned to a tank and re-used.

2nd—Non-recirculating type, in which the fluid is run to waste.

Circulators should be of the dual type or so constructed that the temperature of one-half of the mould can be controlled independently of the opposite half.

(3) Instrumentation

1st—Accurate temperature control of the injection cylinder by proportioning pyrometers, which will prevent overriding or underriding of the pre-set temperature.

2nd—Dependent on the number of heat zones, a third or fourth pyrometer is necessary to control the temperature of the long nozzle required to mould nylon. However, a press equipped with a heated nozzle to mould nylon can be used for any moulding material and in some instances may prove to be a decided advantage over an unheated nozzle.

3rd—An accurate surface hand pyrometer should be available to check the temperatures of the cylinder walls against the control pyrometers, to detect any wide variations in temperature and to locate dead heater bands.

All pyrometers should be inspected periodically and repaired or adjusted and, at the same time, the thermocouples should be inspected, cleaned and repaired if necessary. Dirty or corroded thermocouples are frequently a source of incorrect temperature indication by the pyrometer.

Thermometers cannot always be located in a mould to record the exact surface temperature, and a surface pyrometer is invaluable for this purpose.

(4) Granulators and Chunk Cutters

Virgin material as delivered to the moulder is of fairly uniform particle size which should be duplicated as nearly as possible when regrinding scrap sprues and runners to ensure satisfactory moulding conditions.

Nylon pieces ¼ in. or 1 in. thick can be successfully ground in a chunk cutter.

Reground material which is fed back periodically from a granulator located at the injection machine will not require drying, but reground material which has been placed in storage should be dried.

(5) Screening Reground Materials

Screening of material may not be necessary for moulding certain types of pieces, but for quality control of industrial items it is necessary to duplicate as nearly as possible the fairly uniform particle size of the virgin material and eliminate fines.

Fines have a proportionately greater surface area to volume than do the larger particles, hence they pick up or absorb a proportionately larger amount of moisture.

For example, a 1/10-in. cube has a surface to volume ratio of 1 to 60, whereas a 1/100-in. cube has a ratio of 1 to 600, or 10 times the proportionate surface area of the larger cube.

Fines, because of their smaller size, heat more rapidly in the injection cylinder, resulting in non-uniform plastifying.

Vibrating screens are available for screening and can be furnished in 10 mesh or finer.

Fines can be dried and remoulded.

I can see no good reason why granulators cannot be equipped with the usual screen and with another vibrating screen below to remove the fines and eliminate the extra screening operation.

(6) Weight Feeding

This is not a new idea. We used it in 1940 on a job where we had a large projected area and insufficient clamping capacity. We tried to interest the well-known companies who manufacture scales into developing weight feeding, but without success.

Lately, several companies have developed weight feeders.

The term "starved weigh feeding" is a misnomer because "starved" means skinny, emaciated and under weight, and if you use this term when talking to a customer he might get the idea you are short-changing him.

A better designation would be exact or precise weigh feeding.

(7) Hopper Loaders

Hopper loaders are a convenience and reduce handling costs.

(8) Degating

The size and type of moulded piece and the number of pieces required will determine whether hand trimming or mechanical multiple die degating is required.

(9) Annealing Bath for Nylon

The salt bath is used to anneal nylon pieces, and to clean or burn out the nylon in nozzles and injection cylinders or other metal parts.

Pieces are annealed at 350° F. for the following periods of time:—

Pieces up to ⅛ in. thick—10 minutes.

Pieces from ⅛ in. to ½ in.—20 minutes.

Cool the parts slowly in a cardboard container, using cardboard layers.

The colour of the nylon is influenced by the time in the annealing bath, so it is desirable to keep this time as short as possible consistent with complete annealing.

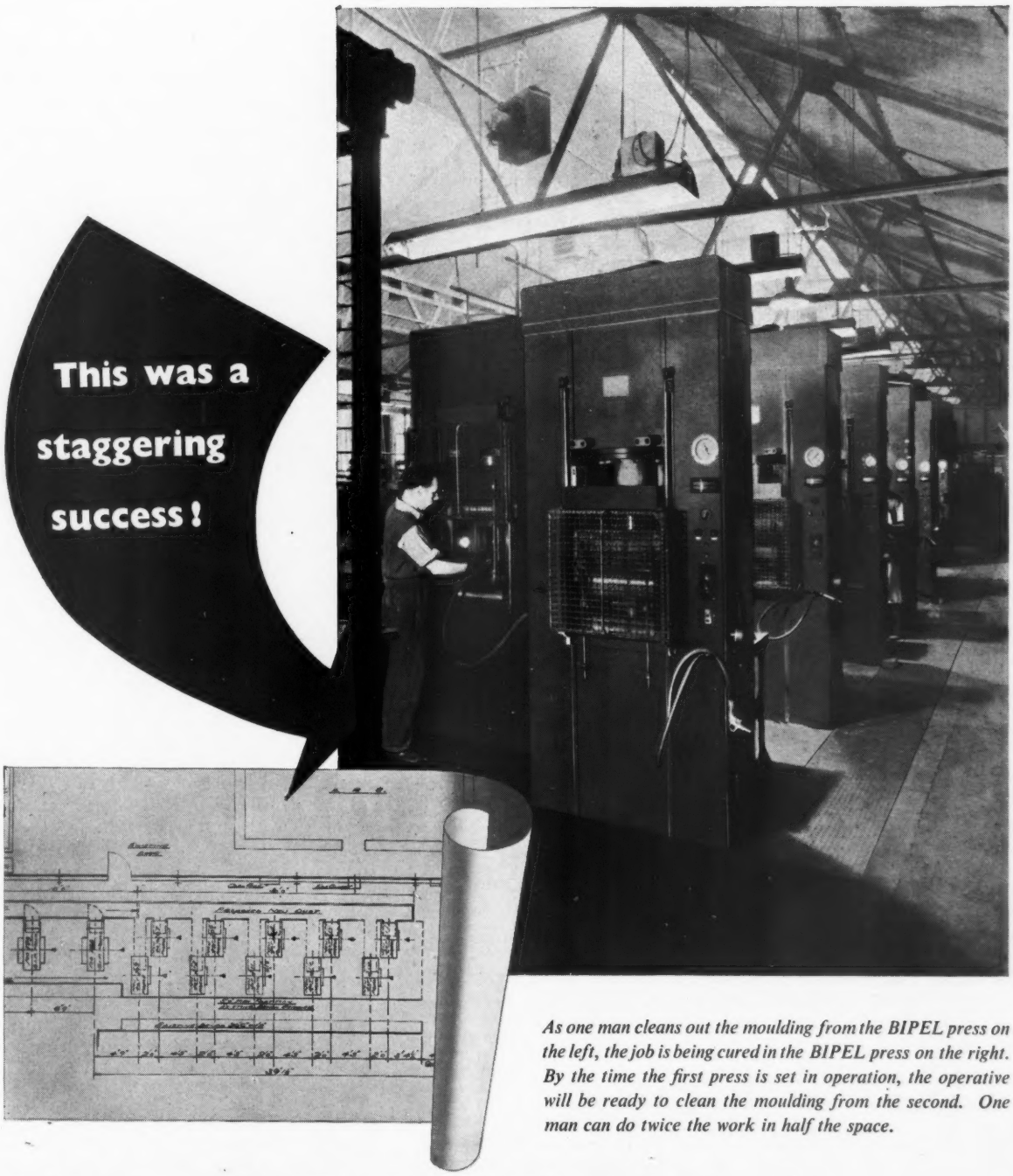
Metal parts require 700° F. to burn off the nylon.

Nozzles should not be quenched in water, but allowed to air cool. Any salt remaining on the surface can be washed off with warm water.

(10) X-ray Machine

The X-ray machine is used to examine the interior of non-transparent moulded pieces for internal bubbles.

However, this method is not too reliable, especially for thin pieces having very small voids.



As one man cleans out the moulding from the BIPEL press on the left, the job is being cured in the BIPEL press on the right. By the time the first press is set in operation, the operative will be ready to clean the moulding from the second. One man can do twice the work in half the space.

One of the many advantages of the BIPEL system is its adaptability to a compact layout.

Take British Moulded Plastics Ltd. for instance. Lack of available space coupled with heavy commitments compelled them to find a way of putting the largest possible number of presses into the smallest possible amount of space.

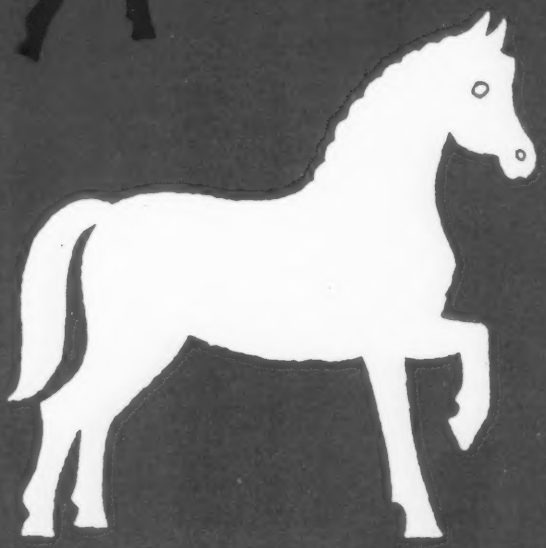
This was a staggering problem—and staggering was the operative word. By using BIPEL transfer presses and placing them in a staggered position, B.M.P. have found that it is possible not only to save space but also to cut down on the number of operatives, for one man can look after two presses.

Consequently, twice the number of mouldings have been produced with half the number of operatives and all concerned have benefited. We at BIPEL are happy to know that once again the quality and efficiency of our presses has helped a customer to do a better job.

It pays to invest in THE BIPEL SYSTEM *of hydraulic moulding* B·I·P GROUP

Send for detailed literature to: B.I.P. ENGINEERING LTD., STREETLY WORKS, SUTTON COLDFIELD, ENGLAND

a horse



a horse

of another colour

The Horse of Another Colour is made with Courtaulds cellulose acetate — a material that does the plastics toy industry nothing but good. It won't break in transit — it rarely breaks at all. And it *can't* break with a dangerous cutting edge and lose you the public's goodwill. It *can* make very much better toys — toys that people buy more of.

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Machines for the Industry

Maniplastics Two-inch Extruder

With the co-operation of Maniplastics, Ltd., Hare Street, London, S.E.18, the following notes and illustrations have been prepared on their two-inch extruder. A novel feature of the machine is the welded steel angle frame, and the wide use of stock components.

THE Manistruder Mark 1, 2-in. extruder, was designed to achieve extreme simplicity, great mechanical strength and accessibility in all moving parts, all such parts and components being immediately replaceable as stock items and very easily accessible from the point of servicing adjustment or replacement. In the design of this machine it became very apparent that to accomplish this fact the old idea of a massive casting for the main frame would have to be abolished. It was, therefore, decided to employ a welded steel angle frame (1) which provided enormous strength and immunity from fractures or breaks apparent in a casting.

The Power Unit

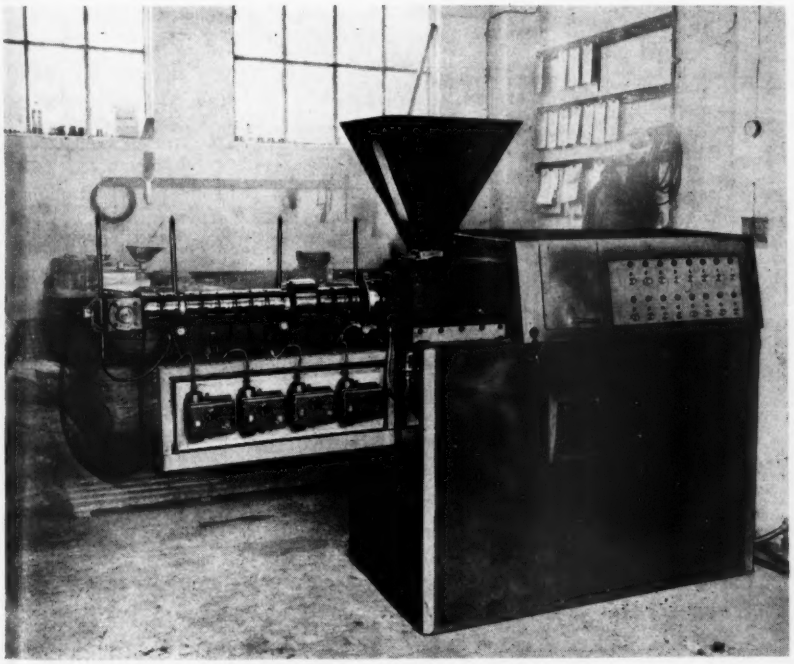
The power unit is composed of a 10-h.p. Brooks motor, one- or two-speed models being available (2). The starting of this motor is accomplished by a MEM start delta starter (3). The power supply for the motor is led in by an armoured cable (4). The motor is coupled by a heavy-duty Renold coupling (5), to a well-known four-speed commercial automobile gearbox (6), which was designed for transmitting loads up to 50 h.p. From the end of the gearbox the drive is taken by a 25-tooth Renold sprocket (7), and a Renold chain of .375 pitch (8). The drive extends to the counter-shaft which is mounted on two very heavy self-aligning bearings (9). On this counter-shaft, which is 2 in. in diameter, is mounted on a common keyway a further Renold wheel of 150 teeth (10). Immediately behind this wheel a further Renold sprocket of 25 teeth is mounted on a common keyway.

The Drive

The drive is extended to the main body of the extruder by a Renold Triplex chain of .75 pitch (11). This chain is engaged on a further Renold wheel of 57 teeth (12) which is mounted with a very heavy key to the main driving shaft (13) which is constructed of 50-ton high-tensile steel.

The Main Body

The main body of the extruder consists of four steel blocks interlocked together by male and female recessed steps and the four components are bolted together by four high-tensile steel bolts. The four components of the body are (14), (15), (16) and (17) respectively. Housed in the section (14) are the three bearings. The first bearing (18), is a 6-in. diameter deep-recessed ball race. Immediately behind this is situated the thrust race (19) which is of a very heavy duty type, 6 in. in diameter and capable of accommodating thrusts of up to 10 tons. Immediately behind this is the tail bearing (20) which is 4½ in. in diameter and is a twin-row self-aligning ball race. An oil seal is provided immediately behind this bearing. In the section of the main body (15) twin oil seals are accommodated ensuring that no lubricating oil situated in the sump of the block (14) can reach the screw. This sump accommodates one pint of lubricating oil, a generous filler cap is provided and an overflow plug to ensure the correct oil level, which are apparent from the drawing.



Side view of Maniplastics 2-in. extruder with crosshead die in position.

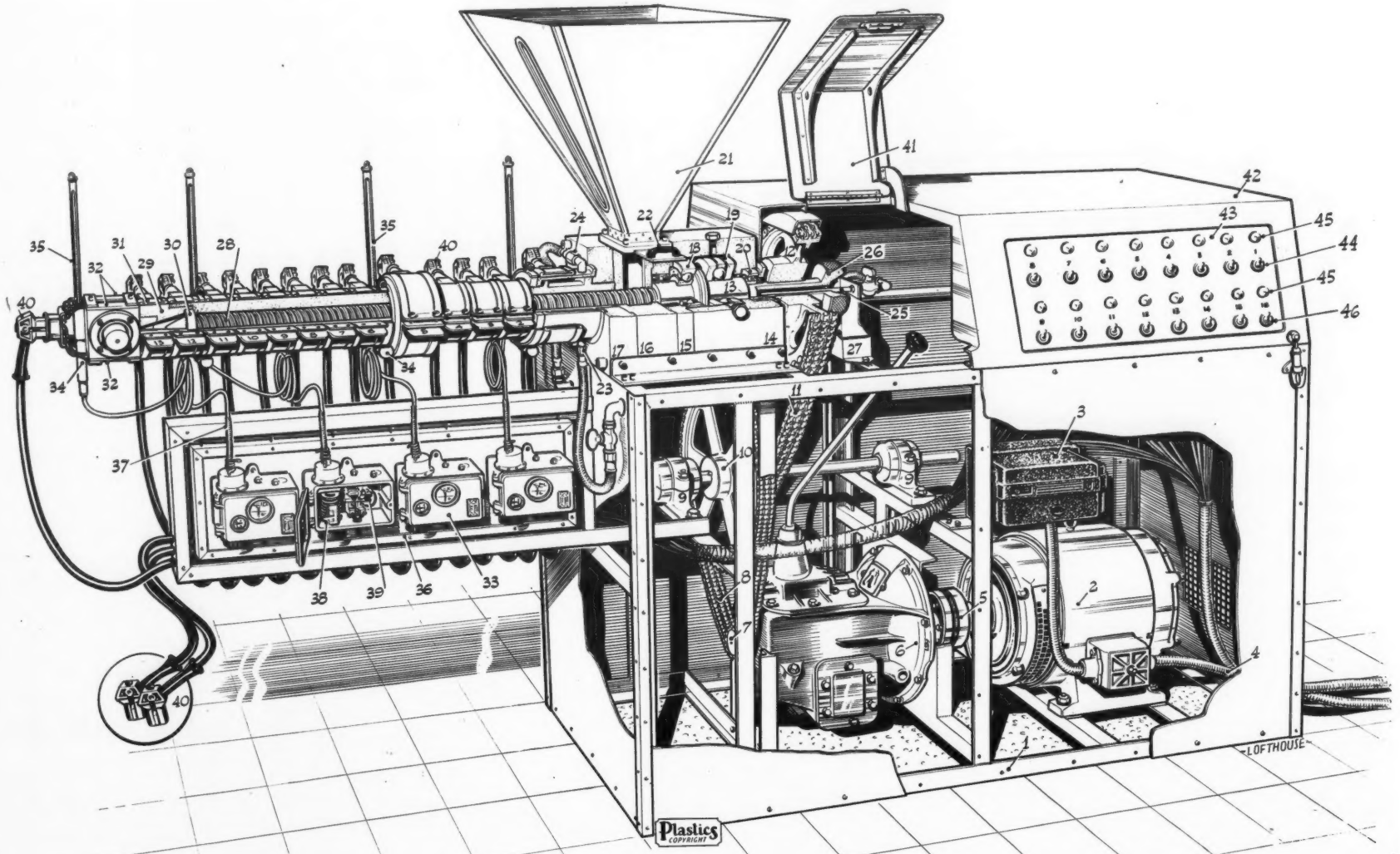
Block and Hopper

The block (16) accommodates a seating for the hopper (21) and also for its cut-off slide (22). The orifice in this block is of a special shape, ensuring an even and consistent feed to the worm. The block (17) is threaded to enable the rear portion of the barrel to be screwed into it and at the back edge of this junction there is a 45° fillet which is filled in with electric welding and machined off, thus ensuring a very strong union between the front plate and the barrel.

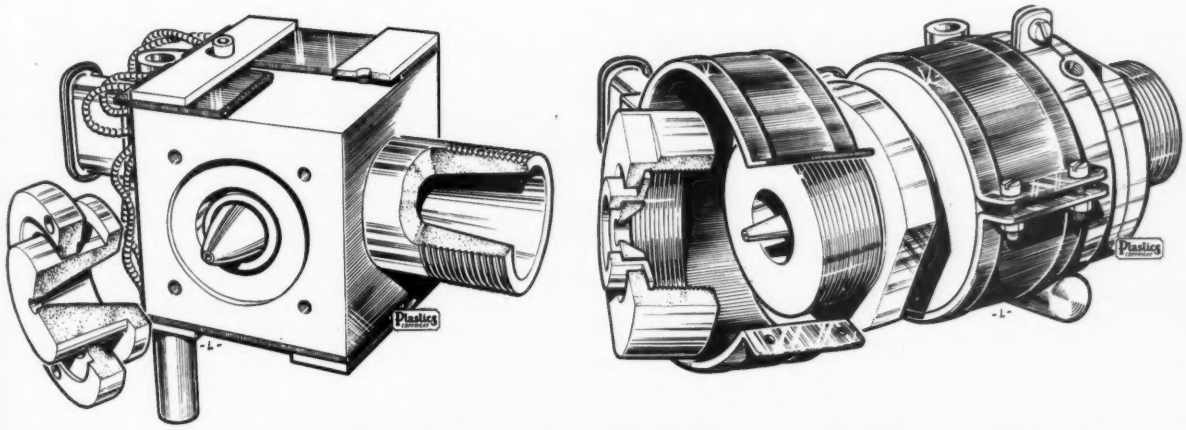
The barrel is internally hardened and ground and at its base there is a detachable water jacket which butts into the block (17). This jacket may be removed by undoing one screwed collar. The cooling water enters the jacket by a flexible armoured pipe through a nipple (23) and the outlet is through a nipple (24) by means of flexible armoured pipe to the main drain pipe. Thus adequate cooling is permitted and excessive heat running back into the hopper is avoided. The worm is water cooled to within ½ in. of the end, through a ¼-in. copper tube (25). A control is provided which ensures constant water-mains pressure at this point so that if the machine is running in a large shop where many machines are being switched on and off, the water supply will not fluctuate.

At the rear of the machine, that is where the final drive occurs, there is a knurled hand wheel (26) which can be unscrewed and immediately the worm can be withdrawn. The inside of this handwheel is of tulip formation so that the outlet water from the worm runs immediately into the outlet tank (27). A tap, which is apparent from the drawing, is provided on this assembly to control the flow.

The front section of the barrel, which is internally hardened and ground, screws into the rear section by a substantial thread and a locating boss which ensures a very accurate alignment. The total length of the bore is 35 in. and the effective length of the worm is the same. The worm (28) is 3 start and of shallow formation and is made from 50-ton high-tensile steel. The adaptor (29) screws into the end of the barrel and located in the adaptor is a torpedo (30). This torpedo is constructed in such a manner that it does



MANIPLASTICS 2 IN. EXTRUDER: KEY TO DRAWING ABOVE:— 1.—Frame. 2.—Motor. 3.—Starter. 4.—Power supply. 5.—Coupling. 6.—Gearbox. 7.—Sprocket. 8.—Chain. 9.—Bearings. 10.—Sprocket. 11.—Chain. 12.—Sprocket. 13.—Driving shaft. 14.—Block. 15.—Block. 16.—Block. 17.—Block. 18.—Bearing. 19.—Thrust race. 20.—Tail bearing. 21.—Hopper. 22.—Hopper cut-off. 23.—Water inlet nipple. 24.—Water outlet nipple. 25.—Water-cooling tube through worm. 26.—Knurled hand wheel. 27.—Outlet tank. 28.—Worm. 29.—Adaptor. 30.—Torpedo. 31.—Band heaters. 32.—Crosshead heaters. 33.—Control units. 34.—Capillary tube sockets. 35.—Thermometers. 36.—Heater panel platform. 37.—Capillary tube. 38.—Bellows system. 39.—Tipping switch. 40.—Point plugs. 41.—Inspection door. 42.—Top hood. 43.—Instrument panel. 44.—Switches. 45.—Indicator lamps. 46.—Switches.



(Left) Crosshead. Heater plug can be seen to left of drawing. (Right) Detail of the in-line head, showing band-type heaters.

not impart any appreciable resistance to the flow of the plastic, as the design of the machine is based so that true plasticization will have occurred before the material reaches this point. Provision is made in the torpedo for the insertion of gauze filters which are essential in certain operations. The two main barrels are heated by 12 Hedin Band Heaters (31). Nine of these heaters are 500 watt, and two, that is the first heater on the water jacket and the fifth heater, situated at the junction of the two barrels, are 1,000 watt. There is another heater of 500 watt situated on the adaptor and torpedo unit.

The crosshead is heated by four flat-type heaters of 240 watts each (32), giving a total of 9,460 watt for all 12. This arrangement enables the barrel to be heated up very quickly and from the moment of switching on until the machine is hot enough to work, a period of only some 12 minutes is needed. The barrel is controlled by three stages of heat control so it can be said it is graded into three zones of temperature. At the requisite points the capillary tubes from the control units (33) are inserted into sockets which accommodate them (34), also providing accommodation for Heath Thermometers (35). The crosshead has a special accommodation for its own capillary tube and thermometer.

The heat control units (33) which are mounted on a sprung platform (36) are Teddington Instruments of Sunbury, and operate on the principle of the capillary tube (37) coupled to a bellows system (38) with a glass-enclosed mercury tipping switch (39). Connection to all heaters is made by two-point plugs (40), which have earthing strips on both sides.

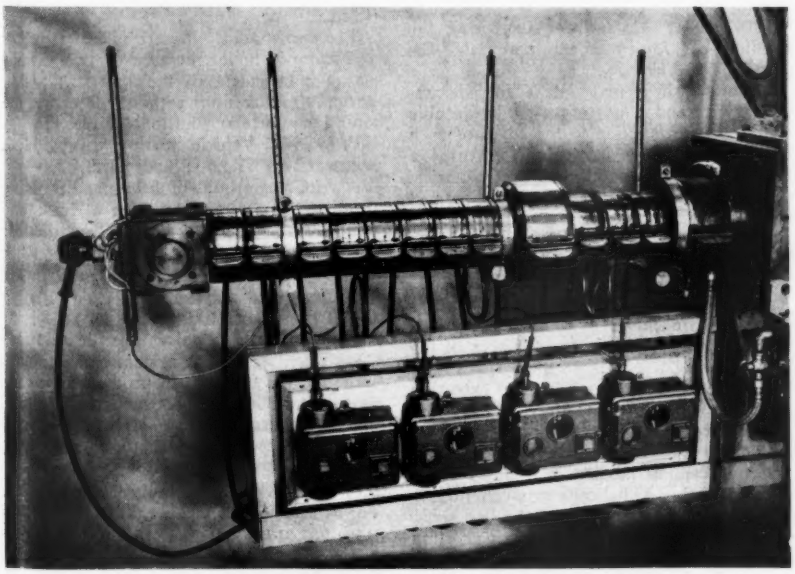
Returning to the main body of the machine, an inspection door (41) is provided giving access to the water control of the worm and to the gear lever of the gearbox. The gear combination of the gearbox together with the counter-shaft impart the following speeds to the screw. First speed—16 r.p.m., second speed—35 r.p.m., third speed—65 r.p.m., fourth speed 108 r.p.m. The top hood (42) is instantly detachable by four spring clips thereby giving perfect accessibility to the whole of the inside of the machine and the electrical equipment. The panel (43) accommodates 16 switches (44) and 16 neon indicator lamps (45). Each of these switches controls its own heater unit. The top row of switches, reading from left to right, are numbered from 1-8 and correspond with the first heater unit at the base of the barrel, and numerically upwards. The bottom row of switches (46), reading from 9-16, are wired likewise. An adjustable air intake is provided in the back panel and the back panel can be slid out after first removing the top hood (42).

The screw was designed to give optimum results on extrusion of p.v.c. but good results can also be obtained with polythene. If it is so desired for continuous extrusion of polythene a two-start screw of special design is provided. In the event of the machine being used for the extrusion of nylon the barrels are not carburized and ground but are internally hard chromed and ground and a special screw is provided. The output of the machine is extremely high and the three-start screw when extruding p.v.c. is capable of driving between 110 and 120 lb. an hour. The hopper (21), which has a window in the front for the operator's guidance, is capable of accommodating 56 lb. of material.

The whole assembly was designed with specific aims. First, a machine that would run for long periods on very heavy loads, and second, a machine which nearly unskilled labour could service and of such robust construction that it would give years of service in a trouble-free manner. The whole of the body panelling and the hopper are finished in polished aluminium sheet.

It is hoped that the Mark II units, now under construction, will incorporate six-channel electronic heat control units together with thermocouples giving six zone temperatures on one display meter which can be switched to the six points of control by a rotary switch. This unit has proved most satisfactory and will control temperatures from 50-380° C. with the greatest accuracy and maintain temperatures within 1° or better. The choice of heat control unit which is fitted, is entirely a matter for the customer.

Opinions amongst extrusion engineers as to the zoning of the temperature ranges are so varied that accommodation is made in the electrical system so that any of the band heaters may be combined into varying heat zones.



View of barrel showing crosshead assembly and heat control panel.

24.—Water outlet nipple. 25.—Water-cooling tube through worm. 26.—Knurled hand wheel. 27.—Capillary tube. 38.—Bellows system. 39.—Tipping switch. 40.—Point plugs. 41.—Inspection door.
33.—Control units. 34.—Capillary tube sockets. 35.—Thermometers. 36.—Heater panel platform. 44.—Switches. 45.—Indicator lamps. 46.—Switches.
42.—Top hood. 43.—Instrument panel.

PATENT REVIEW

The following abstracts have been made from specifications at the Patent Office, with the permission of the Controller of H.M. Stationery Office. The country of origin for Convention Applications is shown in parentheses. Complete specifications can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 2s. 8d. each (including postage).

B.P. 706,179. Method of moulding thermosetting synthetic resin materials. Fairey Aviation Co., Ltd., A. C. Barlow, W. G. D. Carpenter, J. B. Cameron, J. M. Griffith.

The planographic production of designs on the surface of moulded articles is obtained by first applying the design on absorbent impregnated paper which is then applied to the article before it is completely cured. The mould is opened, the sheet applied, the article put back and the curing completed.

B.P. 706,193. Bonding vinyl resin sheet material. M. Seymour. To: B.B. Chemical Co., Ltd. (U.S.A.).

A thin flexible sheet is held from curling and wrinkling by a relatively stiff supporting sheet, e.g. during handling.

B.P. 706,279. Key hanger supports and key hangers therefor. To: Buxton Inc. (U.S.A.).

Moulded as one piece in a single moulding operation from nylon or tenite.

B.P. 706,308. Combined level and try-square. F. Reiterer.

Both arms of the level have at least one bubble tube of unbreakable transparent synthetic plastic material.

B.P. 706,323. Extrusion of plastic materials. H. F. E. Cirket.

In the production of mating sectional forms (fastener strips) the flow of material in the die box is divided into two streams leading to the respective die apertures. These two flows are accurately balanced. The width of the passage is progressively increased in one plane, while the depth at right angles to that plane is progressively decreased.

B.P. 706,385. Strops for razors and razor blades. C. Horswood.

The stropping element consists of a smooth-surfaced piece of resilient synthetic resin such as polymethyl methacrylate without admixed abrasive.

B.P. 706,399. Manufacture of carpets and rugs. G. May. To: V.G. (London) Ltd.

Yarn is wound into loops on formers, then coated with a synthetic resin (polyvinyl chloride or acetate, plasticized) which forms the bond between the windings when cured. The loops are then cut and the formers removed.

B.P. 706,402. Artificial teeth and compositions, methods and apparatus for forming the same. To: Dentists Supply Co. (U.S.A.).

The enamel portion comprises a special copolymer forming resin. This is advanced to the gel stage and then maintained in that stage while placed (spatulated) in the recesses of the face part of the mould in which it is bonded to the preformed tooth body parts made from suitably coloured methyl methacrylate.

B.P. 706,412. Ethylene interpolymers. G. D. Buckley, L. Seed. To: I.C.I. Ltd.

The products resemble polythene but are more flexible and more transparent and stronger. For films, for sheathing cables, and as interlayers in safety glass.

B.P. 706,432. Materials suitable for gaskets. To: British Thomson-Houston Co., Ltd. (U.S.A.).

Glass fibre mat coated with a composition containing a finely divided copolymer of vinyl chloride and vinyl acetate in a dispersion medium.

B.P. 706,442. Bobbins. H. N. Ewer. To: G. and E. Equipment and Contracts, Ltd.

Bobbins for the textile industry of, e.g. polythene, with a driving flange having moulded therein metal insets to take the pressure of the dogs.

B.P. 706,484. Non-fibrous cellulosic material and process of treating same. W. M. Wooding, T. J. Suen. To: American Cyanamid Co. (U.S.A.).

To improve the water repellency of a cellulosic film, at least one surface is impregnated with a modified water soluble urea-formaldehyde resin. A plasticizing agent is introduced, the material dried, the resin partially polymerized, finally a water repellent coating applied.

B.P. 706,577. Synthetic resins. British Oxygen Co., Ltd., S. A. Miller, M. Kaufman.

Polyvinyl acetate is made more resistant to temperature, organic solvents, water, deformation by heating it with a polymerizable compound (triallyl phosphate). Articles may be directly produced from this resin, or laminated articles may be made by impregnating suitable base materials, or adhesives or coatings prepared.

B.P. 706,582. Building plates. H. Hoening (Germany).

In the construction of glass buildings, an insulating layer is inserted between cover plates of glass consisting of thin sheets of cellulose acetate or polyvinyl chloride with raised portions or depressions so as to ensure the formation of layers of air in between. Plates built up in this manner to a thickness of 2.5 cm. (1 inch) provide a thermal insulation equivalent to 38 cm. (15 inch) of brickwork.

B.P. 706,590. Method for increasing the rigidity of folded sheet material. To: Novacel S.A. (France).

Cellulose sheet material is folded concertinawise and a coating of a hardenable synthetic resin applied to the edges of each of the folds. On hardening, it forms a reinforcing strip along the edges. Cylindrical star-shaped cross-section may be formed from the treated sheets, e.g. for fluid-filter elements.

B.P. 706,593. Bag-sealing devices. W. A. Bedford. To: United-Carr Fastener Corp.

Synthetic organic plastic bags for packaging foods are closed by a U-shaped metal clip clamped around the twisted neck of the bag.

B.P. 706,608. Plastics mixing and extrusion machine. To: Dow Chemical Co. (U.S.A.).

The machine is a modification of a plastics extruder. Two compressive screw sections are connected in tandem in a single cylindrical barrel. A helically-grooved mixing section is interposed between the two screw sections. Over the end of the mixing section towards the discharge there is provided a rectangular longitudinally disposed opening (devolatilization port), through which the plastic mix is effectively freed from volatile matter without interruption of the output and without applying a vacuum.

B.P. 706,620. Knobs and handles for control devices. C. Lacy-Hulbert, F. L. Hillman. To: Simplex Electric Co., Ltd.

The knobs are built up from two or more portions carrying different (primary and secondary) markings and formed as separate parts. The portions may be moulded from different coloured synthetic resins.

B.P. 706,647. Lamp shades. Universal Injection Plastics Ltd., J. Johnston.

A frame composed of frame members forming a unitary moulding supports pendant ornaments hanging from the frame members. Each ornament is an individual moulding formed for direct attachment to the frame. Transparent plastics are used.

B.P. 706,721. Process for making cellular bodies. To: Lonza Elektrizitaetswerke und Chemische Fabriken A.G. (Switzerland).

Closed-cell gas-expanded thermoplastic resin articles of regular cell structure are obtained by using hydrogen with the blowing agent in a certain way so as to avoid irregular escape from the resinous mass.

B.P. 706,771. Cellulose derivative compositions. P. R. Hawtin, J. A. John. To: British Celanese Ltd.

Carboxylic-acid esters or ethers of cellulose plasticized with condensation polymers of ethylene glycol and phthalic acid. For films, sheets, mouldings.

B.P. 706,850. Ink stand. L. P. Martin. To: W. A. Shaeffer Pen Co.

Reservoir ink stand with overflow chamber for dip-type writing pens. No spilling or drying of excess ink.

B.P. 706,852. Protective gloves, mitts and the like. G. K. White, H. White. To: James North and Sons Ltd.

A fabric glove with longitudinal seam along outside wall of thumb and encircling base seam is dipped into the protective material while on a former, then cured. The position of the seams ensures correct flow of the coating material after dipping.

B.P. 706,854. Injection press. G. Cayla (France).

The two mould parts are locked together and clamped under pressure by two pistons acting independent of the approach piston in opposite directions without subjecting the mould supports to additional forces.

B.P. 706,872. Vehicle steering wheels. H. J. Spicer. To: Wilmot-Breeden Ltd.

A wire ring around a sheet-metal pressing forming the central boss with at least one arm is surrounded by a rim of mouldable plastic material.

B.P. 707,002. Process for the preparation of oil-modified alkyd resins. To: British Industrial Plastics Ltd. (U.S.A.).

A methyl ester, a polycarboxylic acid and a saturated polyhydric aliphatic alcohol are simultaneously reacted to produce a surface coating material (enamels, lacquers, printing inks) of unusually good solvent tolerances, light colour, colour retention and heat resistance.

B.P. 707,007. Organo-polysiloxane resins. To: Monsanto Chemicals Ltd. (Belgium).

B.P. 707,014. Method for producing a decorative roll of plastic material. A. G. L. G. M. Miche de Malleray (France).

A number of coloured strands are longitudinally juxtaposed to form an initial elongated composite roll the cross-sectional area of which is subsequently reduced while the material is still pliable.

B.P. 707,048. Plain bearings. W. H. Tait. To: Glacier Metal Co. Ltd.

The bearing surface comprises boron nitride which may be incorporated in a moulded body of a synthetic plastic powder.

B.P. 707,133. Electric cable insulation or sheathing. E. I. Cooke. To: Telegraph Construction and Maintenance Co. Ltd.

A metal naphthenate incorporated in a polythene or other thermoplastic insulation renders the cable proof against attack by ants or other insects.

B.P. 707,143. Resinous organopolysiloxanes. To: British Thomson-Houston Co. Ltd. (U.S.A.).

B.P. 707,160. Method for manufacturing stencils. A. I. Roshkind. To: A. B. Dick Co. (U.S.A.).

Radiant energy is used and resinous films are preferred that have been oriented or stretched and have an "elastic memory." A number of films impervious to ink compositions are mentioned ("Saran," nylon, Teflon, Pliofilm, etc.).

B.P. 707,186. Razor blade holder. R. H. Steed.

For blades with thick backing edge to be used as knife carried in a pocket.

B.P. 707,189. Stirrer. H. Arnold, W. S. Knudsen (Denmark).

For household use with stirring vane rotatable around handle.

B.P. 707,210. Hydraulic intensifier. W. R. Groves. To: British Industrial Plastics Ltd.

A valve design to prevent leakage causing undesirable pressure build-up in moulding presses.

B. P. 707,234. Document filing equipment and the like. E. L. Shannon, A. Arthur. To: Shannon, Ltd.

A transparent sheath for protecting a label or edge of a record card is folded to form two limbs enclosing the label, the limbs then being fused together by high-frequency heating.

B.P. 707,235. Plasticized compositions. E. J. G. Balley, W. Walker. To: I.C.I. Ltd.

Polymers or copolymers of vinyl chloride are plasticized by a mixture of neutral esters. For extrusion (cable sheathing, textile coating by calendering).

B.P. 707,247. Method of making an expanded material and the product resulting therefrom. C. L. Wilson (U.S.A.).

A detergent-resistant sponge (wash cloth, synthetic chamois skin) can be made from a reaction product of formaldehyde and a polyvinyl alcohol in combination with a dialdehyde.

B.P. 707,263. Polymeric compositions. To: Koppers Co. Inc. (U.S.A.).

Filaments, films and the like are prepared by treating acrylonitrile polymers with an N, N-dimethyl-carbamate ester of a polyhydric alcohol.

B.P. 707,320. Insulated metal wire and coating compositions for use in the production thereof. S. L. M. Saunders, L. W. Coveney, Pinchin Johnson and Associates Ltd.

The wire is passed through a varnish composition of an epoxide resin, a mixed curing agent (alkylated amino-formaldehyde and an organic or inorganic polybasic acid), and an alkyd resin as plasticizer.

B.P. 707,329. Plastic-faced wooden boards suitable for flooring. To: Svenska Cellulosa A.B. (Sweden).

The boards are provided, during manufacture, with a relatively thick layer of a transparent thermoplastic material on the basis of polyvinyl chloride. The layer (foil) is secured by a combination of a thermoplastic and a thermosetting resin over a thin separate layer of wood (veneer) determining the appearance of the board.

B.P. 707,338. Compositions comprising vinyl chloride polymers or copolymer resins. To: Union Carbide and Carbon Corp.

An organo-metallic tin salt of a carboxylic acid and a phosphate, carbonate, or silicate of magnesium are intimately dispersed in the polymer to improve the heat and light resistance.

B.P. 707,361. Loose-leaf fastening device. A. Borer (Switzerland).

Rings which may be of a thermoplastic synthetic resin are connected by a part forming a book-back.

B.P. 707,381. Multi-colour printing. A. I. Sark. To: Chromostyle Ltd.

To render the colours resistant to heat, light, abrasion, polyvinyl chloride and/or polyvinyl acetate and/or other synthetic resins or rubber combinations are incorporated.

B.P. 707,426. Package for fragile articles. C. L. Smith. To: E. S. and A. Robinson Ltd.

The interior element is a sheet of cellulose acetate with a moulded body portion as a bed for the article and arms to be secured to the walls of the (cardboard) container.

B.P. 707,449. Vinyl copolymers and method for the preparation thereof. To: Lewis Berger and Sons Ltd. (U.S.A.).

Heating a vinyl compound with fatty-acid polyesters in the presence of a catalyst (sulphur dioxide) to obtain clear coating agents and materials for resin varnishes.

B.P. 707,452. Stippling tool. S. W. S. Pain.

B.P. 707,490. Porous diaphragms for use as battery separators, filtering media, and for other purposes, and a method of making them. To: Richardson Co. (U.S.A.).

A thermoplastic resin is used as a binder or a combination of thermoplastic (vinyl chloride-acetate copolymer) and thermosetting (phenol-furfural) resins for making sheets from the binder, a solvent, and a porosity-imparting filler.

B.P. 707,506. Bayonet-type electric lamp holders. To: Philips Electrical Industries Ltd. (Netherlands).

B.P. 707,508. Closures for containers. H. L. McInnes.

The cap cannot be removed without giving a permanent indication of the fact visible through a window (e.g. for drugs, medicines, etc.).

B.P. 707,523. Pourer for bottles or the like. J. Faulhaber, P. Wiegand. To: K. Merck, F. Merck.

A resilient plastic ring (polyethylene) is mounted in an annular notch at the mouth of the bottle.

B.P. 707,532. Decorative, ornamental, novelty or like articles and advertising signs. R. A. Brand and Co. Ltd., Franco Signs Ltd., R. L. Warren-Smith.

Lampshades, toys, display articles (letters) are made from a supporting frame of metal wire or plastic strip or rod sprayed over with a web-coating to produce a skin and then sprayed over with a translucent covering coat.

B.P. 707,536. Method and apparatus for continuous production of absorbent material having a basis of regenerated cellulose. To: Aktiebolaget Celloplast (Sweden).

Artificial sponge material in sheet form is produced from an intimate mixture of viscose, small crystals of a water-soluble salt, and a reinforcing medium (loose staple fibres) continuously discharged on a travelling belt and subjected to mechanical treatment, then passed through a coagulating bath, finally dried.

B.P. 707,549. Surface treatment of films, sheets and coatings comprising organic thermoplastic materials. J. Browning. To: I.C.I. Ltd.

Reduction of the tendency to develop electrostatic charges increases the clarity and smoothness of the surfaces, but is especially difficult in the case of hydrophobic surfaces. By contacting such surfaces with a solution of a surface-active agent which will wet but not dissolve the surface, having dispersed therein a synthetic organic polymerization product (e.g. polythene, etc., polyvinyl chloride, superpolyamides, as the case may be) not harder than the surface, of a particle size of 1 to 15 microns, which after drying remains in the surface, complete smoothness is obtainable.

B.P. 707,643. Bags formed from sheet material. To: Cellophane S.A. (France).

B.P. 707,647. Copolymers of styrene and divinylbenzene. R. N. Haward, J. Elly, Petrocarbon Ltd.

A mixture of styrene and divinylbenzene is polymerized while dispersed in an aqueous medium with finely dispersed particles of bentonite and with dissolved gelatin and a neutral inorganic salt. Hard pearls or beads are obtained, e.g. for road signs, cinema screens, etc.

B.P. 707,659. Manufacture of gloves. G. F. Walker. To: Plysu Products Ltd.

From plastic material (polyvinyl chloride). Thumb and fingers are formed separately from the body of the glove blanked out of a flat sheet with holes left for fingers and thumb, which are then attached by radio-frequency welding.

B.P. 707,683. Picture frames. P. W. Harrington. To: Universal Injection Plastics Ltd.

A one-piece moulding of transparent plastic providing both the surrounding frame and the glazing for the front of the picture.

B.P. 707,713. Seats. E. Fuller.

A retaining member of T-shaped cross-section in a slot of the framework of a deck-chair to hold the end of the canvas seating strip. This member may be an extruded plastic bar.

B.P. 707,721. Container adapted for use in playing a game when empty. F. M. Frederiksen.

A circular container (plastic moulding) for pastes, powder, etc., has an annular channel at the bottom with radial ridges and with markings (numbers) on the raised centre platform to be used with a ball like a miniature roulette.

B.P. 707,732. Grinding wheels. E. D. Teague, Norton Grinding Wheel Co. Ltd.

Coping wheels to cut stone and other hard non-metallic materials are made with a thermosetting resin bond which becomes slightly plastic when heated (a phenol formaldehyde resin).

B.P. 707,797. Electrically conducting laminated safety glass. R. A. Gaiser. To: Libbey-Owens-Ford Glass Co.

Electrode failures are due to the extreme differences in temperature at the various surfaces of such units (for de-icing windows in automobiles and aircraft). Difficulties are overcome by placing a non-metallic separator between the electrode area and the glass.

B.P. 707,805. Cigar- or cigarette-holder. V. F. Trombotto, T. M. Capra.

An intermediate sleeve between mouthpiece and tip is adapted to be partly filled with water acting as filter.

B.P. 707,818. Method of shaping blocks of artificial sponges. To: Sponcel Ltd. (France).

The cellulose sponge is passed through a slightly conical heated funnel to be radially compressed.

B.P. 707,819. Nuts of the self-locking or "stiff" type. Philidas Ltd., J. L. King.

Nuts from plastic or other electrically insulating material are formed with slots near one end to produce a self-locking effect while the other end to be held in the panel of radio or other such devices may be provided with anchoring slots.

B.P. 707,840. Containers for fragile articles. A. J. Matchett (Australia).

An open-ended tube with internally flanged ends has fitted thereto supporting members of self-supporting flexible material (cellulose acetate) to hold, e.g., electric light bulbs, electron discharge tubes, etc.

B.P. 707,841. Means for preventing slip between gramophone records stacked on a turntable. L. J. Gooch.

A flat ring with at least one eccentric projection may be moulded from plastic material.

B.P. 707,858. High-voltage bushing insulators. To: Moser-Glaser and Co. A.G. (Switzerland).

The insulator is built up of two co-axial parts. The dielectric constant of the outer part should be at least 100 times that of the inner. The inner material is preferably a low-pressure moulding resin, the outer part may have an additional material (titanium oxide) incorporated in it. The outer part may also be made from a ceramic material.

B.P. 707,946. Asbestos felt moulding material. Cape Asbestos Co. Ltd., R. Gaze.

Rigid mouldings or boards (insulating panels) with a certain minimum content of phenol formaldehyde resin incorporated finely-subdivided in the wet mix, which is subjected to further treatment in a beater, etc., dried, severed, impregnated additionally, so that the total resin content is not less than 40%.

B.P. 707,964. Roof-covering materials. M. Jones, A. R. Milne, E. G. Williams. To: I.C.I. Ltd.

A plurality of vinyl chloride polymer sheets separated by a core of expanded material.

B.P. 707,966. Articles consisting essentially of a polymer of tetrafluorethylene and the manufacture thereof. A. T. B. P. Squires, C. G. Hannah. To: Rolls-Royce Ltd.

"Low-pressure" spots are avoided by producing a moulded preform applying pressure through a rubber sheet to a charge of dry moulding powder, then sintering the preform. Metal reinforcements (layers of gauze or wires) may be used to avoid "cold flow" by an applied stress.

B.P. 707,974. Optical projection system. J. H. Taylor. To: Electrical and Musical Industries Ltd.

A part-spherical mirror and a corrector plate (Schmidt-type system) are mounted as a unit, a cathode-ray tube is positioned in the unit facing the mirror and free to move axially but not radially. The materials of unit, tube and support are so chosen that changes in temperature do not affect the focus of the image projected from the tube screen. Mirror, corrector plate and supporting struts are made of plastic material, e.g. of methyl-methacrylate.

B.P. 707,979/980. Corrugated sheeting for roofing, walls or other similar purposes. R. M. Dew. To: I.C.I. Ltd.

Materials employed for the roofing elements include polymethyl methacrylate, polymethyl α-chloro-acrylate and polyvinyl chloride, and laminates, e.g. prepared from phenol-aldehyde resins.

B.P. 707,986. Accessories for use with corrugated structural materials. R. M. Dew. To: I.C.I. Ltd.

B.P. 708,009. Guide roller for a traverse mechanism for the winding of rayon filaments. To: Comptoir des Textiles Artificiels S.A. (France).

The roller is made with closely spaced rubber flanges on a "Bakelite" or ebonite hub.

B.P. 708,019. Electrical insulating material. To: British Thomson-Houston Co. Ltd. (U.S.A.).

Heat- and flame-resistant fibrous-base materials are obtained by impregnation with sodium borisilicate and melamine formaldehyde resin.

B P. 708.025. Articles consisting essentially of a polymer of tetrafluorethylene and the manufacture thereof. A. T. B. P. Squires. C. G. Hannah. To: Rolls-Royce Ltd.

A thick moulded sintered article is produced from alternate layers of powder and reinforcement (metal gauze or wires), to which moulding pressure is applied to produce a preform. This is then sintered and cooled.

B.P. 708,028. Particulate synthetic resinous moulding materials. W. R. D. Manning, F. Grant. To: I.C.I. Ltd.

A sheet of heat-softened moulding material, especially of material based on polymethyl methacrylate and polystyrene but also on phenol formaldehyde resins, is fed between the nips of two pairs of grooved unheated rolls so that the scoring of the sheet caused by the second pair intersects the scoring made by the first pair. The sheet is then hardened by cooling and broken along the scored lines.

B.P. 708,029. Stabilization of polyamides. To: E. I. Du Pont de Nemours and Co. (U.S.A.).

B.P. 708,049. Articles consisting essentially of a polymer of tetrafluoroethylene and the manufacture thereof. A. T. B. P. Squires, C. G. Hannah. To: Rolls-Royce Ltd.

Thin sheet-like articles are made from layers of the moulding powder separated from one another by linen tracing paper. Pressure is applied simultaneously to the charges, producing a number of preforms corresponding with the number of layers, which are then sintered. In this way, "low-pressure" spots can be avoided. Metal reinforcements (gauze or wires) may be used.

B.P. 708,055. Flexible materials and method of making same. W. H. Hogg, T. R. Evans. To: Dunlop Rubber Co. Ltd.

Composite sheets of textile fabric and plasticized polyvinyl chloride for golfers' gloves, faces of table tennis bats, etc., are made by feeding a p.v.c. dispersion through a perforated screen onto a backing sheet. The screen is then stripped off and the compound fused on the sheet.

B.P. 708,122. Loom pickers. Thomas and John Walton Ltd., R. Walton, F. S. Walton.

The picker is manufactured from layers of nylon by moulding or compressing nylon filaments or woven nylon fabrics or nylon powder bonded together. Inserts of leather, hide, plastic materials (Alkathene) may be used.

B.P. 708,124. Coloration process. E. Simms. To: I.C.I. Ltd.

Refers particularly to the manufacture of polymers of alkyl methacrylates. To improve fastness to light, a basic dyestuff and a zinc salt are incorporated in the polymerizable liquid.

B.P. 708,146. Device for use with musical instruments. M. M. Porter.

For players of wind instruments, a stiff curved cap is fitted over the front teeth of the player to act as shield between the teeth and the lip. The device may be produced in acrylic resin by a method similar to that used in dentistry.

B.P. 708,149. Device for peeling citrus fruits. J. Levitin.

The device, which may be made of polystyrene, cellulose acetate, urea formaldehyde (or partly of metal or wood), is characterized by a self-adjusting spring-biased automatic cutter.

B.P. 708,167. Display device. F. M. G. Barnes.

A holder of transparent plastic on a rocker base integral with it and a receptacle for the material (liquid) to be displayed.

B.P. 708,201. Injection-moulding machines. To: Lester Engineering Co. (U.S.A.).

The cylinder and spreader assembly is readily removable for servicing or replacement by avoiding axially interfitting surfaces on spreader and cylinder or threader connections into which moulding material can creep and freeze spreader and cylinder together. The spreader is integrally formed with internal channels terminating in openings of circular cross-section.

B.P. 708,203. Dials having a dial plate of transparent material, more particularly for use in radio receivers. To: Philips Electrical Industries Ltd. (Netherlands).

The plate is made of polystyrene, the (coloured) connecting piece (or pieces) of polymethyl methacrylate.

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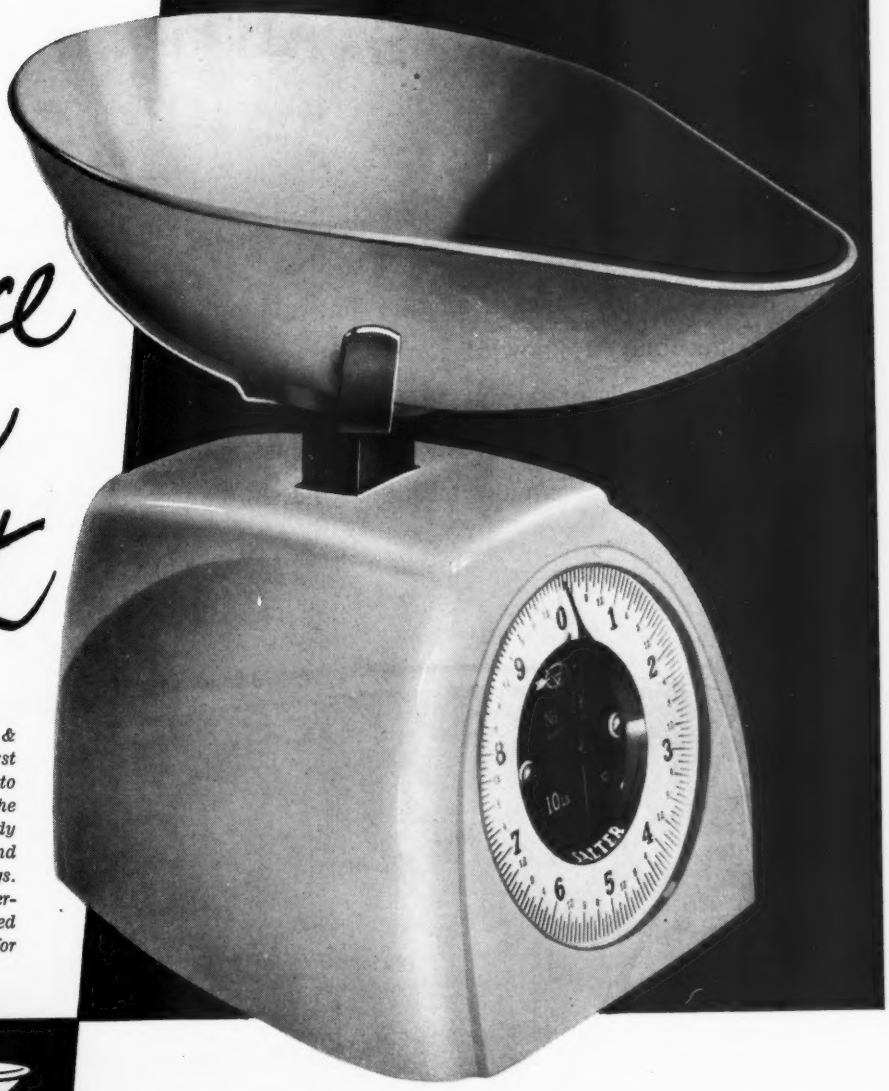

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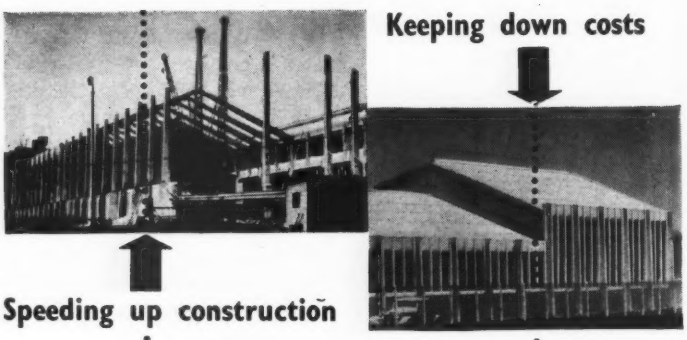

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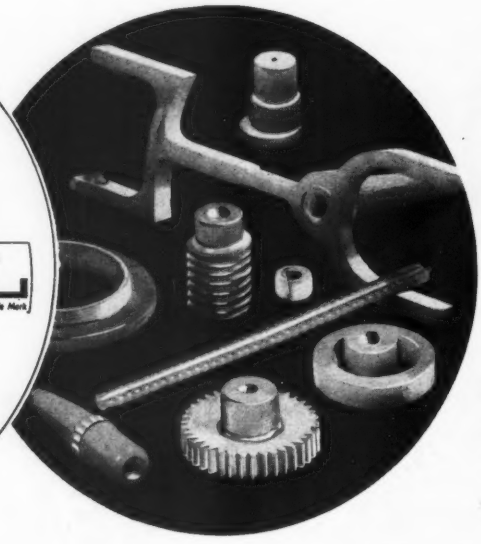

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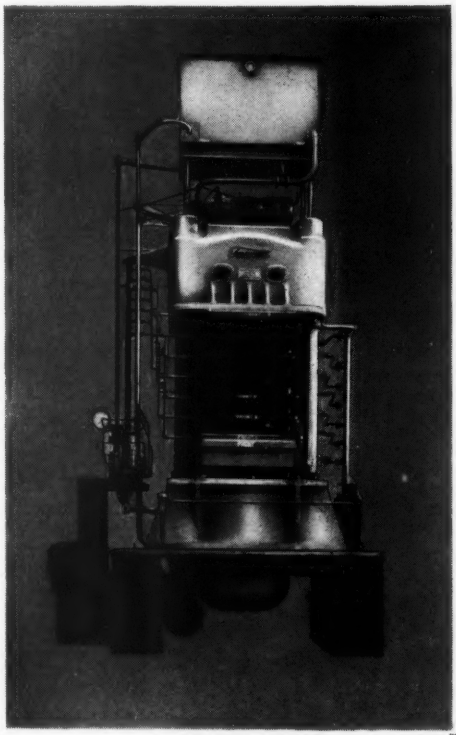

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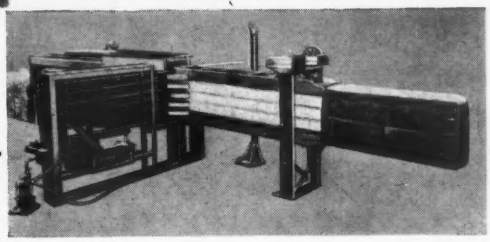

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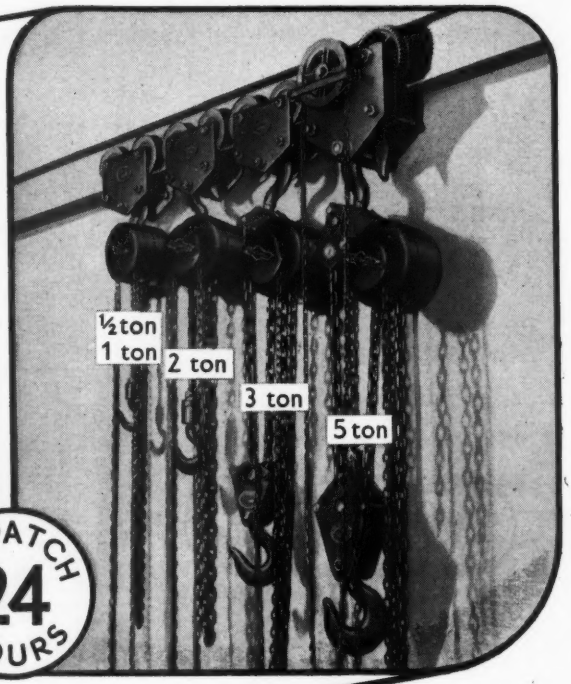

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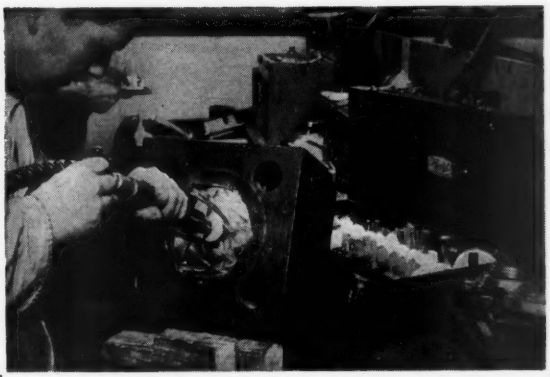

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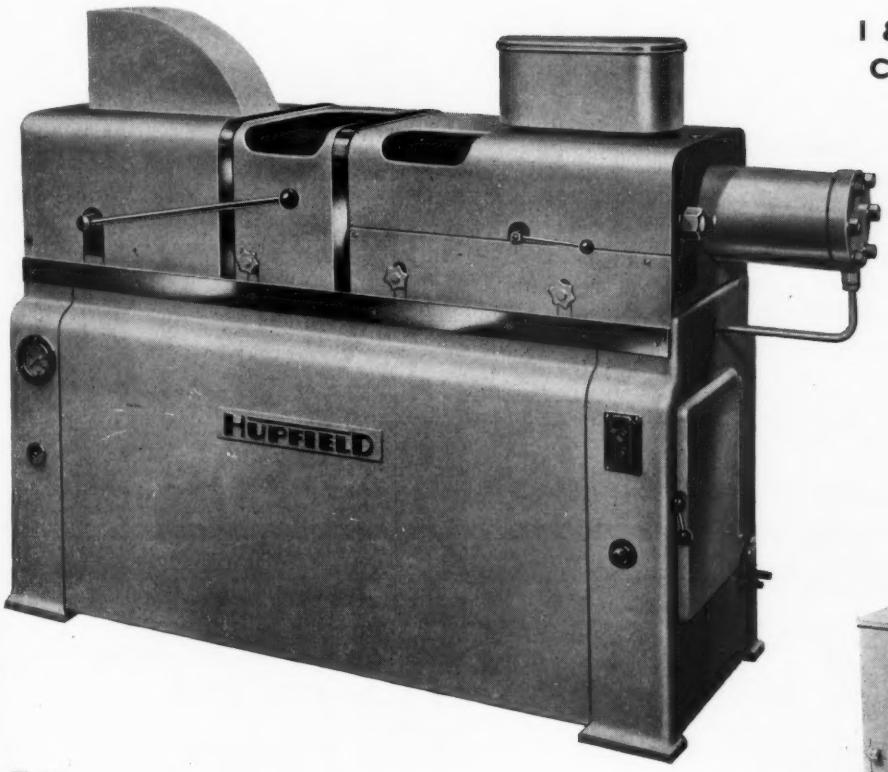

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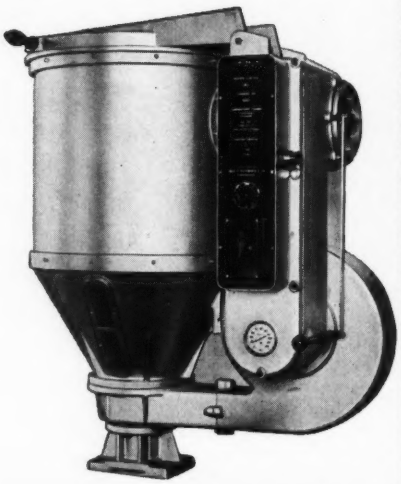

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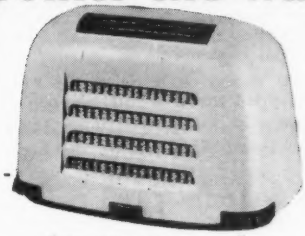

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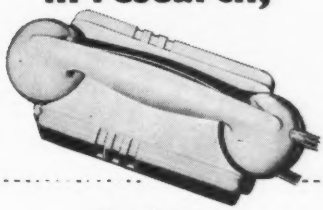

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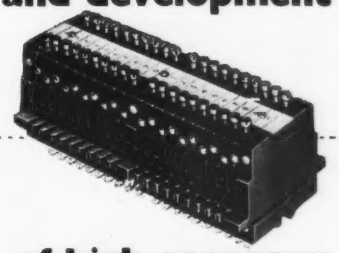

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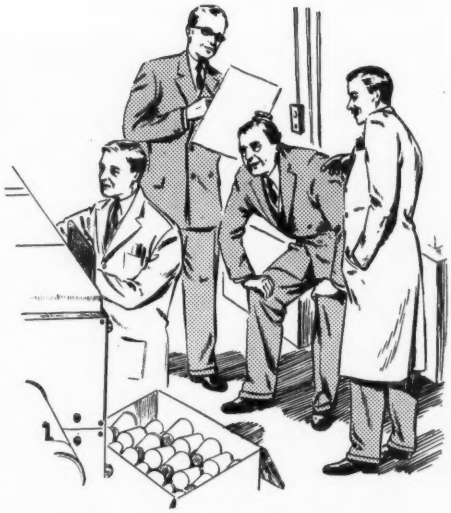

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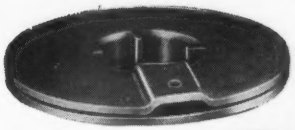

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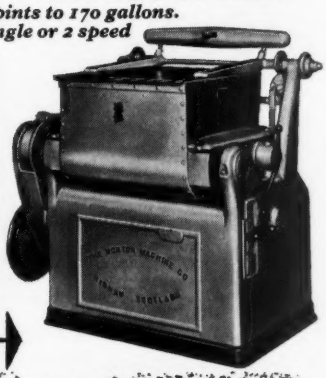

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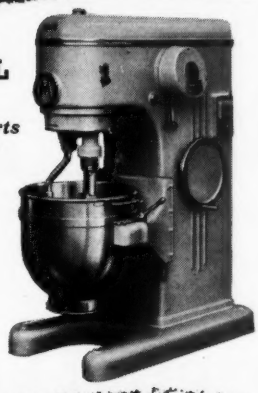

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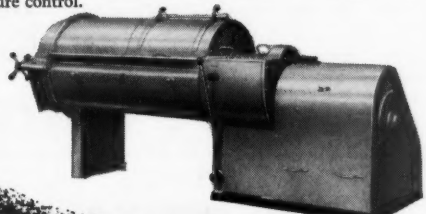

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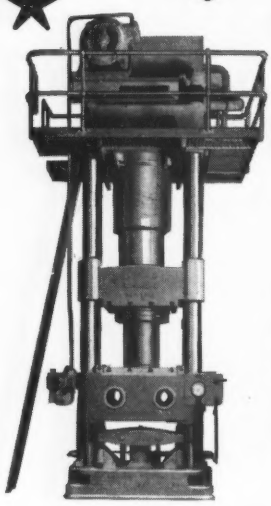

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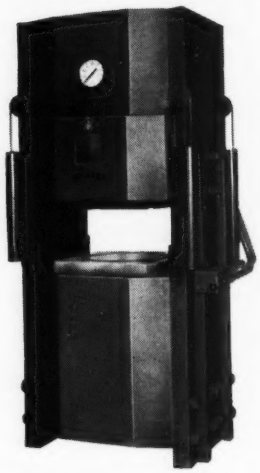

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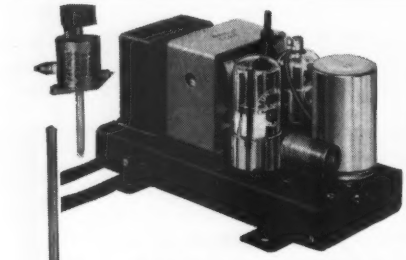

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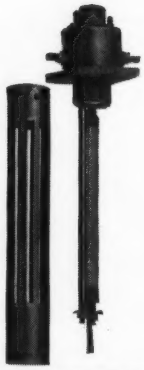

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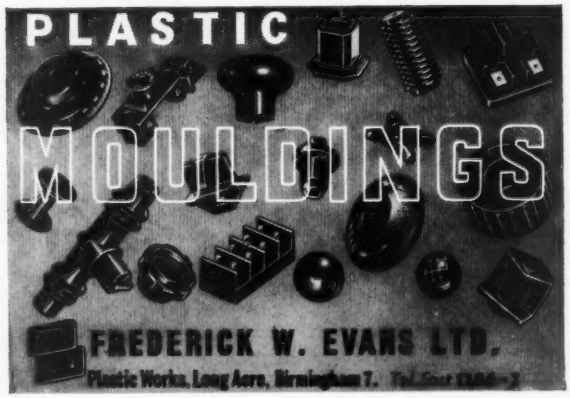

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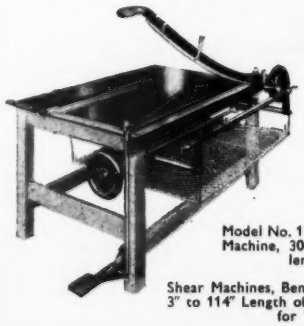

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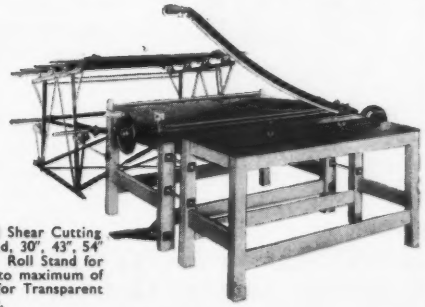

Model No. 1 R.F. Hand Shear Cutting Machine with Roll Stand, 30", 43", 54" and 60" length of cut. Roll Stand for any number of rolls up to maximum of six. Specially suitable for Transparent Film, etc.

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By Vivian Stannett

THIS IS THE First Book to be entirely devoted to a thorough technical survey of the properties and potentialities of this well-known thermoplastic. It is designed to be of equal interest and value to the business man and the engineer or chemist, and includes a chapter on packaging and container applications.

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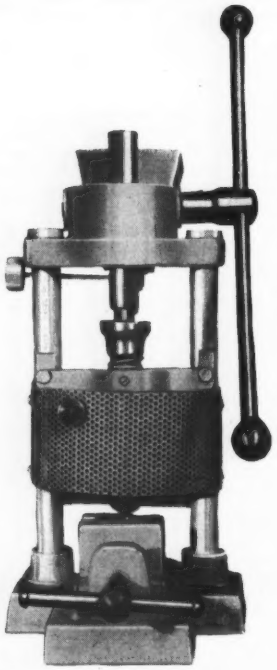

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THE **S. P.** INJECTION MOULDING MACHINE

A small self contained machine to plug into the normal electric supply.

Suitable for:-

Short production runs.
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Over 120 moulds to choose from if required

Full particulars from:-

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AJAX
Air Turbine
HAND GRINDERS
FOR YOUR MOULDS

AJAX JUNIOR

Weighs only 8 oz. Speed approx. 90 000 R.P.M. For Grindstones ⅛" to ¼" dia. Sturdy Spindle Collet bored for ¼" dia. shanks. Air Pressure required 50-100 lbs./sq. in.

Leaflets P2 and P3
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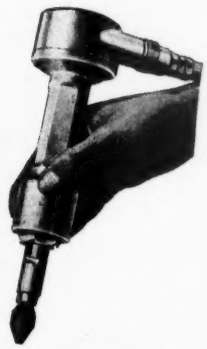
Please state Air Pressure when ordering.



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Powerful, yet easily handled. Speed approx. 50,000 R.P.M. For Grindstones ⅛" to ¼" dia. Collet bored for 6 mm. or ¼" dia. shanks. Air Pressure required 50-100 lbs./sq. in.

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Birmingham, 12
Phone CALTHORPE 2995

IMPERIAL CHEMICAL INDUSTRIES

Highest Sales in Company's History

DR. ALEXANDER FLECK ON PROPOSED PROFIT SHARING SCHEME

The twenty-seventh Annual General Meeting of Imperial Chemical Industries Limited was held on June 17 in London.

Dr. Alexander Fleck, the chairman, presided and, in the course of his speech, said:—

The sales in 1953 were the highest in our history, and with new plants coming into operation we can confidently look forward to further increases in the years to come.

The net income of the Company for 1953 before appropriations for dividends and reserves was more than £17½ millions. The true profits for 1953 available for appropriation are really better than those of either 1951 or 1952.

The Board's intentions, announced two years ago, of bringing the Ordinary share capital more into line with the true capital employed in the business by the capitalization of reserves, can now be carried out.

Pharmaceutical Industry

In the Annual Report reference is made to the attitude of the Ministry of Health towards the cost of pharmaceuticals required by the National Health Service. Any effort by a Government Department to cut down waste and extravagance is commendable. In this instance, however, there is the serious danger that a rather unintelligent application of quite inappropriate costing methods may damage or even destroy the most vital parts of the pharmaceuticals industry in this country. The danger is that pharmaceutical research may be rendered so unattractive in this country and so unprofitable that this important field of research may be abandoned by one company after another, and this country may be forced to rely upon the scientific achievements of other countries. Research for new drugs is, and must remain, highly speculative; only a small part of the research effort can ever be directly fruitful, but when success is achieved the cost of all the work which has proved fruitless for its original purpose must be taken into account. The profit on the successful discovery must cover the cost of the unsuccessful research if any concern is to be encouraged to carry on this speculative but valuable work. Even the successful product may hold the field for a short time only and be replaced by some other product discovered either in this country or overseas. Costing principles permitting a very limited percentage of profit on the manufacturing cost of a commodity may no doubt be appropriate and proper in some cases, but I suggest that in the case of drugs which it is decided to produce and which the National Health Service wants, the rigid and unimaginative application of such principles will lead to results that are unfair to the industry.

Nationalization

The Board remain as firmly as ever opposed to every form of nationalization of the Company. They keep this subject of the danger of nationalization under constant consideration and will continue to do so even though the danger may from time to time appear to recede.

Profit Sharing Scheme

The references in the Report and in the Press to the proposed Profit Sharing Scheme for employees will not have escaped your notice.

Any scheme which gave employees a cash sum regularly each year would suffer from the disadvantage that the receipt of the sum would become a normal expectation and would lose the character of profit-sharing. If for any reason the amount had to be reduced or withheld altogether, there would be widespread comments among employees probably suggesting hardship. At the same time, any scheme which distributed each year very large numbers of exceedingly small holdings in the Company would be unsatisfactory and difficult to administer. The Board believe that the Scheme proposed, which puts the net bonus to the credit of the employee in the accounts of Trustees appointed for the purpose, and provides for the issue of a Stock Certificate to the employee himself only when the account reaches a reasonable figure, is more likely to induce employees to retain their holdings of Stock than one in which the shares were issued each year direct to the employees.

We believe that the Scheme which we propose to introduce will play a useful part in bringing management, factory payroll and Stockholders together and in spreading a better understanding of our mutual interests.

The Scheme provides for an increase in the bonus if dividends are increased. Stockholders and employees will thus both share in any increased prosperity which it may be our good fortune to enjoy in future years. They will also have some share in any adversity which we may suffer.

Bonuses under the Scheme are in no way part of the terms and conditions of employment and are not intended to be a substitute for fair wages and conditions.

The Outlook

So far this year the Company has enjoyed, in common with other industries in this country, a period of expansion, and the prospects are in general good. In overseas markets competition is strong, but we believe that we can hold our own and in some directions gain further ground. Neither at home nor overseas can there be any easing-up, but with competent, loyal and energetic personnel throughout the whole organization, we have every reason to believe that difficulties will be overcome and further progress made both this year and in years to come, when much of the present capital expenditure will be completed and will give us additional productive capacity.

The report and accounts were adopted.

The proposals for capitalization of Reserves and Scrip Issues were duly approved at the Extraordinary and Class Meetings subsequently held.

Classified Advertisements

PRESS DAY.—Classified advertisements for the August issue must be received at head office by first post July 27th.
Last-minute additions and deletions are accepted by telephone from trade advertisers up to noon. Advertisements received too late for a particular issue are automatically inserted in the succeeding one unless instructions to the contrary are received.

RATES.—4d. per word (minimum 12 words 4/-). Each paragraph charged separately and name and address must be paid for. Semi-displayed setting 35/- per single column inch. Series discounts of 5% for 6, and 10% for 12 consecutive insertions allowed to trade advertisers.

TERMS.—Strictly net and prepayable. Monthly accounts or settlement by the end of the month following insertion are allowed to trade advertisers if satisfactory references are provided.

REMITTANCES.—Cheques and postal orders should be crossed and made payable to TEMPLE PRESS LIMITED and instructions sent addressed to the Manager, "Plastics," Bowling Green Lane, London, E.C.1.

THE PROPRIETORS retain the right to refuse or withdraw advertisements at their discretion and are not responsible for clerical or printers' errors although every care is taken to avoid mistakes.

BOX NUMBERS.—Private advertisers desiring to have replies sent care of "Plastics" may do so on payment of 1/- to cover booking and postage, plus cost of four extra words. To avoid mistakes in forwarding, Box Numbers should be carefully and legibly copied and replies sent to Box P000, care of "Plastics," Bowling Green Lane, London, E.C.1.

DEPOSIT SYSTEM facilities are available to readers to purchase advertised goods through "Plastics." Commission 1% (minimum 2/-) on amount deposited.

HEAD OFFICES: Bowling Green Lane, London, E.C.1, England. Telephone: Terminus 3636. Telegrams: "Pressimus, Rhone, London."

BRANCH OFFICES: 5, Suffolk Street, Birmingham, 1. Telephone: Midland 4117-8. 50, Hertford Street, Coventry. Telephone: Coventry 62464. 1, Brazennose Street, Manchester. Telephone: Blackfriars 5038-9. 12, Renfield Street, Glasgow. Telephone: Glasgow Central 1413.

BUSINESS OPPORTUNITIES

DESIGNERS. INVENTORS. PATENTEES.

We are always open to consider ideas, suggestions and propositions for compression mouldings. Write Box P9922, care of "Plastics." zzz-470

CONSULTANTS

PULVERIZING, grinding, screening consultant. E. D. W. Kidd, Weymede, Byfleet, Surrey. 209-1072

MACHINERY, TOOLS AND PLANT

ALTERATIONS. Diesel sets, electric motors, switch gear, transmission equipment, fluorescent lighting and industrial fittings ex stock, keen prices. Contract G. L. Murphy, Ltd., Menston, near Leeds. zzz-210

HYDRAULIC PRESSES

400-ton Greenwood and Batley upstroke hydraulic press with 16-in.-dia. fiscolized ram by 28-in. stroke and two 2¾-in.-dia. pushback rams. Four columns 22½ in. by 20½ in. Table area 34½ in. by 22½ in. Daylight 3 ft. 4½ in. W.P. 2 tons sq. in.

100-ton downstroke hydraulic press by Finney. Ram 12 in. dia. by 20-in. stroke and two 2-in.-dia. pushback rams. Four columns, distances between 20½ in. by 14½ in. Tee slotted tables 2 ft. sq. Daylight 32 in. Arranged for prefilling. W.P. 1 ton sq. in.

80-ton downstroke hydraulic press by Finney. Ram 10½ in. dia. by 18-in. stroke with two 2-in.-dia. pushback rams. Four columns, 21 in. by 10 in. between. Tee slotted tables 18 in. sq. Daylight 30 in. Arranged for prefilling. W.P. 1 ton sq. in.

50-ton upstroke hydraulic press by Thompson, having 8-in.-dia. fiscolized ram and two 1-in.-dia. pushbacks by 14-in. stroke. Four columns 20 in. by 5 in. Table 20 in. by 14 in. Daylight adjustable, 21 in. to 30 in. W.P. 1 ton per sq. in.

50-ton upstroke hydraulic press by Finney. 8-in.-dia. fiscolized ram and two 1½-in.-dia. pushback rams by 20-in. stroke. Four columns 15 in. by 10 in. between. Table area 16 in. by 15 in. Daylight 24 in. W.P. 1 ton sq. in.

Two 25-ton upstroke hydraulic presses by Thompson. 6-in.-dia. fiscolized ram by 12-in. stroke. Four columns 15½ in. by 6 in. Table 15½ in. by 12 in. Daylight adjustable, 18 in. to 12 in. Fitted are a pair of 1-in.-dia. pushback rams. W.P. 1 ton sq. in.

Two 25-ton upstroke hydraulic presses by Plastics and Rubber M/cy. 4-in.-dia. ram by 10-in. stroke. Four columns 11¼ in. by 6¼ in. between. Table 12 in. by 11¼ in. Daylight 13 in. W.P. 2 tons sq. in.

10-gramme hand-operated injection moulding machine by Francis Shaw, mounted on a steel frame, having two main tie bars 1½ in. dia. and 7½ in. between. Band-type heater.

Three single-punch pelleting machines by Duncan Stewart, for making tablets up to 2¼ in. dia. by ⅜ in. thick. Max. filling depth 1¼ in., rate 30 per min. With 5 h.p. motor and starter.

Masson grinding and defibrizing mill by Blackfriars Eng. Co.

Two water-cooled grinding discs with vertical adjustment. Motorized 40 h.p. 400/3/50.

GEORGE COHEN SONS AND CO., LTD.,
WOOD LANE,
LONDON, W.12.
Phone, Shepherd's Bush 2070.
AND
STANNINGLEY, NR. LEEDS.
Phone, Pudsey 2241. 204-35

INJECTION MOULDING MACHINE, 8-oz. capacity, Reed Prentice type. Reply to Box P045, care of "Plastics." 204-14

FOR SALE.—1, 25-ton Bradley and Turton press, 1, 100-ton Bradley and Turton, 1, 50-ton Thompson, 1, 150-ton Thompson. Box P0437, care of "Plastics." 204-x606

Machinery, Tools and Plant (contd.)

HYDRAULIC. Frazer Mono-radial pumps, new and second-hand, in stock. Thompson and Son (Millwall), Ltd., Cuba St., London, E.14. East 1844. zzz-440

COMPLETE, NEW AND AS YET UNERECTED PLANT FOR THE MANUFACTURE OF

SYNTHETIC RESINS

(SYSTEM DR. KRAHL)

AVAILABLE FOR SALE ON FAVOURABLE TERMS.

The Plant which is designed for continuous working and was originally intended for the manufacture of compressed fibre sheets, can be used in the manufacture of synthetic resin of all types.

FOR FURTHER PARTICULARS,
PLEASE WRITE TO:—
BOX NO. P0436, CARE OF "PLASTICS." 204-48

PLASTIC SHEETING. Complete casting plant with modern carbon recovery installation in perfect condition for sale, preferably as a unit, but would consider disposal of items singly. Box P044, care of "Plastics." 204-15

PLASTICS MACHINERY.
Hydraulic Presses of all sizes. Injection Machines. Extruders. Mixing Mills. Hydraulic Pumps and Accumulators.
Send your inquiries to the specialists,
REED BROTHERS (ENGINEERING), LTD.,
REPLANT WORKS,
CUBA STREET, MILLWALL, E.14.
Phone, East 4081 (five lines). 204-44

TWO A.K. HAND-OPERATED PRESSES, ash tray, cup, saucer, eggcup moulds, heaters and hermostats, the lot £150. All perfect condition, lying Stamford, Lincs. Box P0422, care of "Plastics." 204-x9915

MACHINERY, TOOLS AND PLANT WANTED

INJECTION MOULDING MACHINES REQUIRED. Condition or size not important. Send details. Box P023, care of "Plastics." 207-1062

We are ready to buy good plastics machinery and are at present particularly interested in pre-form pelleters, moulding presses over 20 tons, extruders for P.V.C., etc., and pumps to give working pressure of 2,000 lb./sq. in. or more. Prompt inspection and offers made for suitable items.

GEORGE COHEN SONS AND CO., LTD.,
WOOD LANE, LONDON, W.12.
Phone, Shepherd's Bush 2070.
AND
STANNINGLEY, NR. LEEDS.
Phone, Pudsey 2241. 205-1064

COMPRESSION AND INJECTION MOULDING TOOLS wanted. Send details of your surplus, obsolete and redundant moulding tools. Box P0113, care of "Plastics." 206-01057

WANTED: two 3 ounce, two 4 ounce, one 6 ounce, one 8 ounce injection moulding machines, in good working condition.
Nield's Patents, Ltd., Penarth Rd., Cardiff. 205-1065

MISCELLANEOUS

EXTEND YOUR TRADE.
Use a trade mark. Consult
Trade Mark Protection Society,
12 Church St., Liverpool. zzz-478

MOULDS

IF YOUR INJECTION MOULDS ARE TOO COSTLY or troublesome this new firm of master craftsmen, with many years practical moulding experience, will produce them for you, cheaper, correctly designed and guaranteed to work without expensive tryouts. Box P046, care of "Plastics." 206-1071

MOULDS WANTED

REDUNDANT TOY MOULDS wanted, injection up to 16-oz.), must be in first-class condition ready for immediate production. Box P0421, care of "Plastics." 204-18

PATENTS

THE PROPRIETORS OF BRITISH PATENT NO. 647045 which relates to a method of bonding the abutting edges of material, are desirous of exploiting the invention by way of licence or sale, inquiries should be addressed to Andrews and Byrne, 201 Bank Chambers, 329 High Holborn, London, W.C.1. 204-46

PRODUCTION CAPACITY

INJECTION MOULDINGS AND PLASTIC COVERINGS in acetate alkathene, p.v.c. machined parts in brass, steel and plastics.
We now have extra capacity and can offer quick delivery at our new factory. We solicit your inquiries.
F. A. Ketch and Son, Ltd., Trent Valley Works, Lichfield, Staffs. Lichfield 3052. zzz-476

SHORT RUNS A SPECIALITY: LONG RUNS A PLEASURE. Low mould costs and overheads. Injection capacity and technical knowledge at your service. Westminster Plastics, 367 High St. North,, London, E.12. Grangewood 3777. 212-1055

VISIJAR LABORATORIES, LTD.
THE LEADING CRAFTSMEN IN
"PERSPEX."
PROTOTYPE AND REPETITION.
OFFICIAL I.C.I. STOCKISTS "PERSPEX"
SHEET, TUBE, ROD.
STOCKISTS AND FABRICATORS OF "FORMICA."
149 LONDON ROAD, CROYDON, SURREY
Phone, Croydon 1384. zzz-467

INJECTION MOULDING by I.O.G. Industries, Ltd., 41 Marshgate Lane, Stratford, E.15. Maryland 2804. 208-1034

DINES PRODUCTS, Whitehall Lane, Grays, Essex, for injection mouldings. 211-1050

REPETITION in Ebonite, Erinoid, etc. Capstan lathe work. Temple St., Rugby. 210-1043

TUBE LAMINATION ENGINEERING, LTD.,
HIGH WYCOMBE,
BUCKS.
Phone 1921-2.
MAKERS OF
SYNTHETIC RESIN BONDED TUBES.
ROUND, SQUARE AND RECTANGULAR
FABRICATORS AND ASSEMBLERS
IN PLASTIC AND METALS.
FULL SUPPORTING MACHINE SHOP
AVAILABLE. zzz-472

INJECTION MOULDING CAPACITY available up to 3 oz., precision moulding a speciality. Guardian Plastics, 76 and 77 Rahere St., London, E.C.1. 210-1042

INJECTION MOULDINGS IN THERMO-PLASTICS. Moulding in styrene, acrylics and acetate. Design and toolroom facilities available for mould construction. Inquiries invited. J. and E. Courtenay, Ltd., 138 Stratford Rd., Birmingham, 11. 208-1067

Production Capacity (contd.)

PLASTICS (MANCHESTER), LTD.,
BRITAIN'S LEADING STOCKISTS AND DISTRIBUTORS.
SPECIALISTS IN
FABRICATION, INJECTION MOULDING AND ENGRAVING.
11 WHITWORTH STREET,
MANCHESTER, 1.
Central 7081-2 and Central 1000. zzz-468

KINGSTON PLASTICS, LTD., Unity Works, Union St., Kingston-on-Thames. Manufacturers of virgin and second-grade cellulose acetate moulding powders, matched to customer's own requirements for colour and flow. Customer's own waste also reprocessed to specified requirements. Sorting and grinding incorporating magnetic separation of metallic particles of all thermoplastics undertaken. Phone, Kingston 8405. 207-1063

ELCO PLASTICS, LTD.,
HIGH WYCOMBE, BUCKS.
Phone 1921-2.
OVER 50 PRESSES.
EXPERIENCED COMPRESSION, TRANSFER AND INJECTION MOULDERS.
DESIGNERS AND MAKERS OF MOULDS ON THE PREMISES.
CAPACITY UP TO 500-TON COMPRESSION AND 10 OZ. INJECTION.
LARGE ASSEMBLY SHOPS.
A.I.D. APPROVED. zzz-473

COMPRESSION AND INJECTION MOULDING capacity immediately available in all thermosetting and thermoplastic materials. Customers' own moulds can be used or tools provided in our up-to-date tool room. Box P996, care of "Plastics." 204-41

INJECTION MOULDING
CAPACITY AVAILABLE TO
32 OZ.
SPECIALISTS IN PEN MOULDINGS
AT REALLY KEEN PRICES.
ROLLRITE PLASTICS,
HEREFORD.
Phone, Hereford 4782. 209-1069

PULVERIZING for the trade. L. Lipton, Ltd., Phoenix Works, Lamprell St., E.3. Advance 3345. 205-1070

CHIPPING OF PLASTICS AND GRINDING, screening, mixing and drying of all raw materials undertaken for the trade. Crack Pulverizing Mills, Ltd., Plantation House, London, E.C.3. Man 4405. 204-42

PLASTIC WELDERS have surplus capacity willing to take sub-contract or will manufacture complete article. Box P0414, care of "Plastics." 204-5

ULTRA-MODERN FACTORY offers injection moulding capacity of 2 oz. and 3 oz. at keen rates. Box P0410, care of "Plastics." 204-9

INJECTION MOULDING capacity. Two 16 oz. machines immediately available. Inquiries to Box P047, care of "Plastics." 204-13

PRODUCTION CAPACITY WANTED

LONDON MANUFACTURERS require compression moulding capacity for long runs on small components, first-class multi-impression moulds supplied by advertisers. State capacity available. Box P0431, care of "Plastics." 206-1073

RAW MATERIAL

PERSPEX! PERSPEX!! PERSPEX!!! Official stockists for I.C.I. acrylic sheets. Sheets cut to your requirements. Fabrication and mounting specialists to the trade:—

S. C. Errington (Hanwell), Ltd., 132a Uxbridge Rd., Hanwell, London, W.7. Phone, Ealing 5288. zzz-460

ALWAYS LARGE STOCKS OF
CASEIN
RODS, TUBES AND SHEETS.
PERSPEX
SHEETS UP TO 1 IN. THICK.
CELLULOSE ACETATE
CATALIN RODS.
S.R. (PLASTICS), LTD.,
93 ALDERSGATE STREET, E.C.1.
Phone, Monarch 4686. 210-1037

Raw Material (contd.)

SAVE TIME AND MONEY!
If you require a good service for turned parts in all plastics—or—
Supplies of casein, ebonite, fibre, laminated bakelite, in rods, sheets and tubes, or cellulose acetate and butyrate tubing, contact: A. E. Goodeve, Ltd., 188a Seven Sisters Rd., London, N.7. Archway 3654-6721. 211-1054

2,000 FT. RIGID P.V.C. TUBING, ¾ in. o.d. by 3/64 in. Offers invited. Write Box P0417, care of "Plastics." 204-2

FOR DISPOSAL: Approximately 1 ton Welvic Paste PA/2. Box P041, care of "Plastics." 204-1

APPROXIMATELY 3½ TO 4 TONS of nitrate cellulose, .010 in. by 1.0625 in., in coils. Will accept best offer. Write Box P863, care of Streets, 110 Old Broad St., E.C.2. 204-24

CUEX, LTD., can offer all at prices well below current list:—

Polystyrene.
Cellulose acetate.
Polyethylene.
P.V.C.
Polyvinyl butyral.
Perspex and Diakon.
Send now for details.
Cuex, Ltd., 270 Corporation St., Birmingham. Central 5474. 204-45

PLASTICS (MANCHESTER), LIMITED.
BRITAIN'S LEADING STOCKISTS
OF
PERSPEX SHEET ROD, TUBE.
11 WHITWORTH STREET,
MANCHESTER, 1.
Central 7081-2 and 1000. 204-43

ROCKITE U.F. walnut surplus for sale. Box P0430, care of "Plastics." 204-29

VINYL ACETATE, reground, some colours. Box P0432, care of "Plastics." 204-30

POLYSTYRENE, virgin and reground, for disposal. Write for particulars Box P0433, care of "Plastics." 204-32

BLACK CELLULOSE ACETATE MOULDING POWDER. We can always supply first grade at 2s. per lb., any quantity. Box P008, care of "Plastics." 204-52

FOR HOME AND EXPORT MARKET. We sell, at low prices, all plastic scraps, Acetate, Polystyrene, Alkathene, re-ground powders and reconditioned powders. Apply to Box P009, care of "Plastics." 204-51

SPECIAL OFFER, 80 sheets 46 in. by 20 in. by ⅛ in. Pinspot pattern Perspex, £1 each. Fabricators and stockists of all Thermo-plastic sheet, rod and tube. P.D.I., Ltd., 60 Livery St., Birmingham, 3. Cen 5855. 204-50

ACETATE scrap of thin sheeting, regular quantities for sale. Box P0434, care of "Plastics." 204-33

P.V.C., hard and soft, for disposal. Please inquire Box P0435, care of "Plastics." 204-34

RAW MATERIAL WANTED

WANTED, Polythene scrap. Write to Box P7416, care of "Plastics." zzz-0322

ERLANOS, LTD., 93 Aldersgate St., E.C. (Monarch 4686), require Perspex and cellulose offcuts and scrap, clear and coloured, highest prices paid. 206-3330

SCRAP.
WE BUY
ALL THERMO-PLASTICS. REJECTED MOULDED PIECES. OBSOLETE MOULDING POWDERS, LUMPS, SPRUES AND RUNNERS.
AND PAY HIGHEST PRICES.
J. W. NASH AND CO., LTD.,
27 BEETHOVEN STREET, W.10.
Ladbroke 3555. 204-53

PROMPT CASH OFFERED for virgin and reprocessed cellulose acetate and polystyrene. Give manufacturer's name and packing. Pox P873, care of "Plastics." zzz-464

POLYSTYRENE, any colour. Full particulars to Box P033, care of "Plastics." zzz-479

SCRAP.
THE
LARGE BUYERS
ARE
MICHAEL STEVENS,
KESWICK ROAD WORKS, S.W.15.
Vandyke 3345-6. 204-49

Raw Material Wanted (contd.)

SURPLUS STOCKS of thermo-setting moulding powder wanted. Send details. Box P0031, care of "Plastics." zzz-475

POLYTHENE AND POLYSTYRENE, any quantities of surplus lots, scrap and nozzle lumps, urgently wanted. Please offer with samples to Herbert Connor, Ltd., 120 Beaufort Park, Falloden Way, London, N.W.11. 204-31

P.V.C. GARMENT AND HANDBAG OFFCUTS wanted. We collect any pay cash. Brockwell Plastics, Ltd., 50 Hollingbourne Rd., S.E.24. zzz-463

REPRESENTATION

PART TIME REPRESENTATIVE OR AGENT required to introduce business for Perspex showcards, sales aids, and Perspex advertising goods, etc., on a commission basis; and to the right person a profit-sharing basis would be introduced. Box P0315, care of "Plastics." 204-1068

SITUATIONS VACANT

The engagement of persons answering advertisements in respect of vacant situations must be made through a local office of the Ministry of Labour, or a scheduled employment agency, if the applicant is a man between the ages of 18 and 64 inclusive or a woman between the ages of 18 and 59 inclusive, unless he or she, or the employment, is excepted from the provisions of Notification of Vacancies Order, 1952.

INJECTION MOULDING MACHINES. Designer-draughtsman is required who has sound and practical experience, capable of initiating design of injection moulding machine. Ultimate position of director.
Applications, which will be treated with the strictest confidence, must include fullest details of past experience and qualifications. Box 0322, care of "Plastics." 205-1066

SALES MANAGER aged 30-42 for technical and industrial glass products including laboratory ware, signal lenses and lighting ware required by the manufacturers of Pyrex glass. Must have good sales experience and ability to promote sales of new products, scientific background desirable, salary £1,300 upwards according to qualifications. Pension scheme and excellent prospects.
Write full details education, experience, age and salary required to Managing Director, James A. Jobling and Co., Ltd., Wear Glass Works, Sunderland. 204-47

SALES MANAGER required to sell glass-fibre yarns and glass-fibre mat to the plastic and engineering industries. Salesmen also required. Please mark applications accordingly. Highly paid positions with pospects for experienced men. Write, giving full details to Glass Yarns and Deeside Fabrics, Ltd., 121 Kingsway, London, W.C.2. 204-12

PLASTICS TECHNICIAN required by important firm of moulders in the north-west, plastics technician as head of a new development department. Men between 30 and 35 with experience are offered excellent prospects.
Please apply, giving references and state salary required, to Box PL042, care of "Plastics." 204-17

PHYSICIST OR ENGINEER required for work on reinforced plastics in connection with the guided-weapon programme. Candidates should have Higher National Certificate or equivalent qualifications. Experience in plastics work would be an advantage. Assistance with housing. Apply in writing to G.S.M., I.C.I., Ltd., Metals Division, Summerfield Research Station, Kidderminster, Worcs 204-26

SOUTH AFRICAN MANUFACTURERS of welded plastic goods require capable man to take charge of their factory. Experience in designing and maintenance of electrodes will be a strong recommendation. Write, stating experience, etc., Box PL0420, care of "Plastics." 204-19

COLOUR CHEMIST required, Hertfordshire, by thermoplastic manufacturers. Excellent progressive opportunity for young man. Reply Box PL0418, care of "Plastics." 204-20

FOREMAN required, Hertfordshire. Wide experience in thermoplastic raw material manufacture essential, good salary, conditions, house provided. Reply Box PL0419, care of "Plastics." 204-21

R. H. COLE AND CO., LTD., require a young, experienced salesman to cover sales of thermoplastic raw materials in the Greater London area.
Apply in confidence stating age, experience and salary required to the Managing Director, R. H. Cole and Co., Ltd., 2 Caxton St., London, S.W.1. 204-22

PLASTICS TECHNOLOGIST required for research and development work on thermoplastic materials used in flooring and buildings materials. Experience of processing thermoplastics an advantage but not essential. Canteen, pension scheme. Please reply, giving briefly qualifications, experience, age and salary required to Technical Director, Marley Tile Co., Ltd., Sevenoaks, Kent. 204-23

WOMAN ARTIST AND COLOURIST with knowledge of materials used in motorcar trim and furnishings required by industrial organization. Good salary and prospects. Apply, giving full details of age, experience, etc., to Box C.G.3004, A.K. Advg., 212a Shaftesbury Avenue, London, W.C.2. 204-25

Situations Vacant (contd.)

ASSISTANT TO WORKS MANAGER, aged 30-35, with degree in chemistry or engineering or similar qualification, required for modern plastics factory S.E. of London. Applicant must be thoroughly acquainted with technology of p.v.c., preferably with knowledge of calendering or extrusion and compounding. Considerable experience essential in either laboratory or plant. The position offers scope to applicants willing to accept wide responsibilities, this is an important appointment offering excellent prospects, salary in relation to knowledge and experience, pension scheme. all applications treated in strict confidence. Full details to Box P0416, care of " Plastics." 204-3

NIGHT FOREMAN required for plastics factory in the Midlands; knowledge of compression, transfer and injection moulding essential. Give full details of experience, wages required, etc., in strict confidence to Box P0415, care of " Plastics." 204-4

OPPORTUNITIES to join the Technical Department of a company operating a group of factories making chemicals and plastics on a large scale, are offered to chemists and chemical engineers. Investigation of existing processes, development of new methods and layouts, are the main jobs of this department which calls for well-trained, qualified and imaginative people. New recruits are needed because of promotion of existing personnel to management positions and general expansion of the company.

The plant is modern and sited in a pleasant non-industrial area. A non-contributory pension scheme is operated.

Please write in confidence, giving a concise account of experience and education to Box P0413 (quoting ref. R.17), care of " Plastics." 204-6

INJECTION MOULDING. An experienced engineer required as assistant to the manager of a new thermo-plastics extrusion and moulding plant in the north of England; experience of injection moulding tool design is required; experience of mould making and production supervision is desirable. Replies will be treated in strict confidence and should state age and present salary and give details of experience in the thermoplastics industry, assistance with housing is available to the successful candidate. Reply to Box P0412, care of " Plastics." 204-7

ASSISTANT RESEARCH CHEMIST required by international company developing synthetic yarns. Responsible and interesting position for young chemist specializing in polymer chemistry. West London laboratory. Applications, giving age, experience invited. Box P0427, care of " Plastics." 204-37

Situations Vacant (contd.)

GENERAL MAINTENANCE ENGINEER for London Plastic Moulding Co. Manufacture of hydraulic presses, pumps, and resin impregnating plant essential; salary £1,000 and upwards according to qualifications and experience. Write full details in confidence to Box P048, care of " Plastics." 204-10

PLASTIC MOULDING (IMPRESSION) FOREMEN required for London factory, good opportunity for experienced men. Write giving full details of past experience in confidence to Box P049, care of " Plastics." 204-11

A VACANCY has occurred for a Plastics Technologist to work on the application of synthetic resins as adhesives and in the manufacture of reinforced plastics. Several years' experience is desirable, some experience is ssential, but it is more important that the applicant be an enthusiastic worker in the adhesive field. Age not less than 28. Modern factory in non-industrial area, non-contributory pension scheme operated. Apply Staff Manager, British Resin Products, Ltd., Hayes Rd., Sully, Penarth, Glam, quote ref. R.22. 204-28

PHYSICIST OR ENGINEER required for work on reinforced plastics in connection with the guided-weapon programme, previous experience of plastics not essential. Candidates should have a good degree, and two years experience in industry is desirable. Assistance with housing. Apply in writing to G.S.M., I.C.I., Ltd., Metals Division, Summerfield Research Station, Kidderminster, Worcs. 204-27

LABORATORY TECHNICIAN, London area, capable developing and controlling thermo plastic vacuum forming plant, salary £600-£750 dependent on qualifications and experience. Box P0424, care of " Plastics." 204-40

FOREMAN wanted, by firm of injection moulders in South Midlands, to take charge of finishing and assembly departments. Must be energetic and able to control female labour. Apply giving full details of experience, age and salary required to Box P0425, care of " Plastics." 204-39

ASSISTANT TO PRODUCTION MANAGER required, with experience in P.V.C. leathercloth, a progressive and interesting position, South London area. Box P0426, care of " Plastics." 204-38

Situations Vacant (contd.)

HIGHLY QUALIFIED ENGINEER required by progressive group of companies engaged in the production of hydraulic presses and associated equipment, applicant to take charge of development and design team. The work is interesting and allows for the expression of new ideas. This is a high level appointment with exceptional opportunities for experienced persons with initiative and drive. Salary will be in accordance with qualifications and experience. Applications should contain full details of education, technical training, qualifications and experience, and will be treated with strictest confidence. Write Box P0428, care of " Plastics." 204-36

SITUATIONS WANTED

INJECTION MOULDING FOREMAN age 34 desires change, development work preferred but anything considered, work given first consideration. Resident London. Box P0423, care of " Plastics." 204-x246

YOUNG MAN aged 24 requires position with progressive firm in Southern counties. Box P0429, care of " Plastics." 204-x295

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